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MAY 1960

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Miami's Master Water
Plan p. 173

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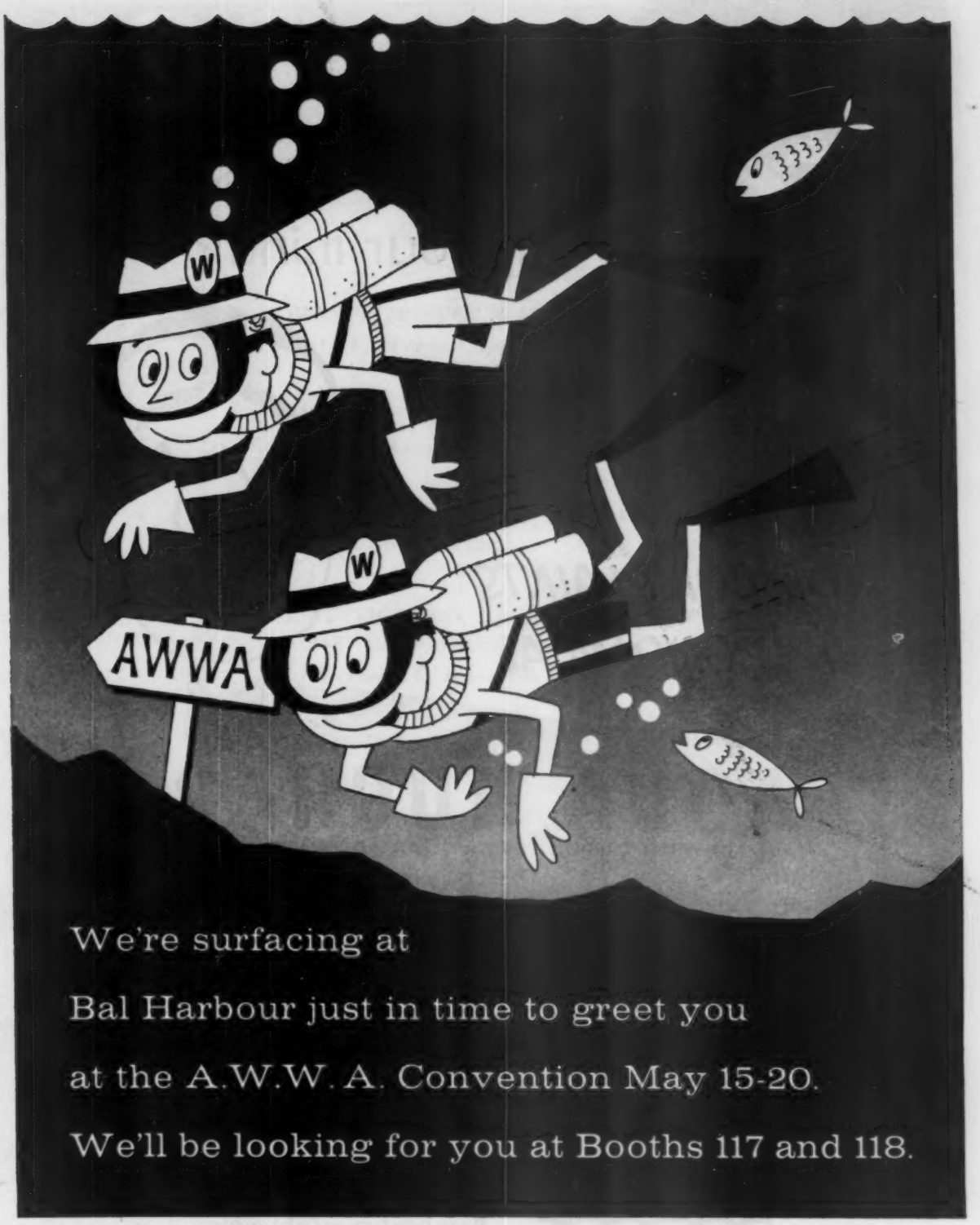

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MAY • 1960

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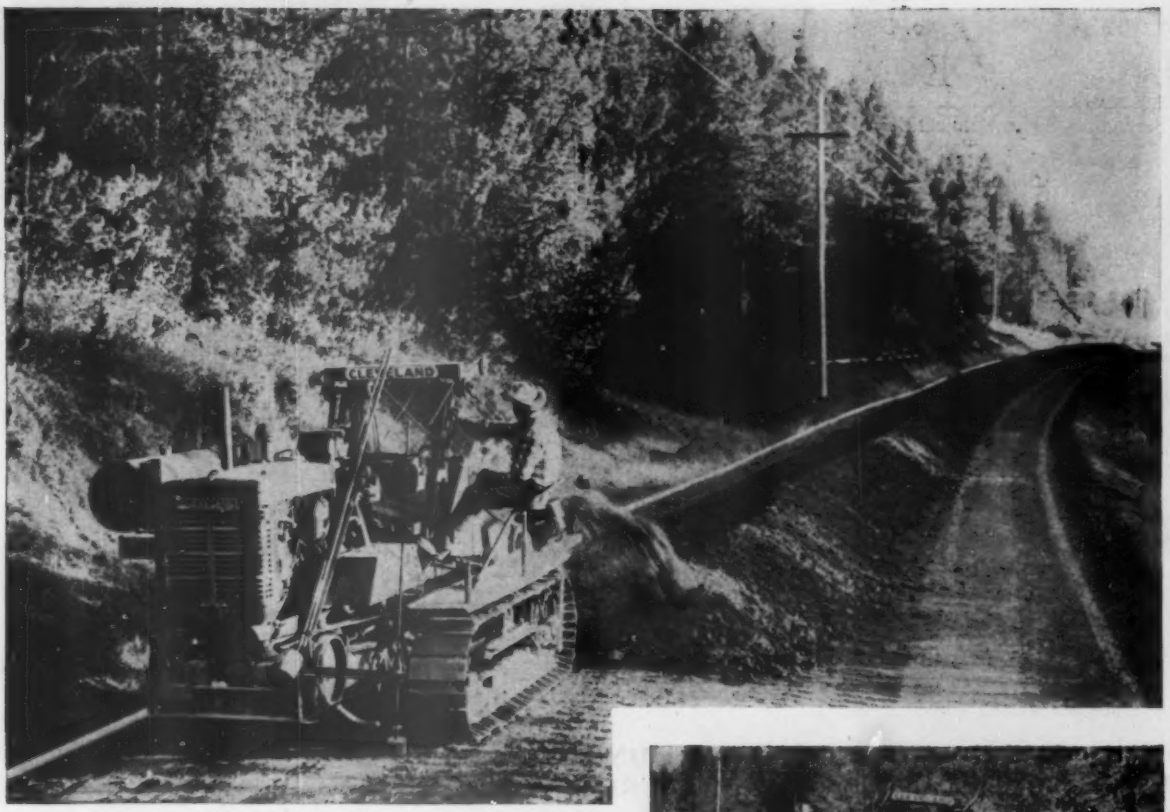

Cleveland 140 digs 38-mile Idaho utilities line

Massart Construction Company of Spokane, Wash. used a Cleveland 140 to dig a 38-mile utilities line eastward from Moscow, Idaho to serve a new refractory at Boville, another brick plant at Deary and smaller users along the line. The Cleveland dug the line 40 inches deep for 4 and 6-inch pipe at a rate of better than 2 miles per day.

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Briefs

Miami's Master Water Plan is a description of this city's long range plans for satisfying its water needs; a plan that emphasizes future development of its facilities to keep up with its anticipated municipal water demands—Page 173.

Pumping Sewage Automatically by using float controlled, variable speed magnetic driven pumps can increase operational efficiency and reduce costs—Page 184.

A Unique Pipe Design enabled Milton, Vt., to save both time and money when it replaced an old, worn-out pipe main—Page 188.

Liquid-Alum Flow Measured—The instrumentation techniques applied to liquid-alum feed are described in this report of a plant scale study—Page 189.

Vacuum Filtration of Digested Sludge is one of the most complex phases of sewage treatment plant operation. The various problems encountered by Westchester County, N. Y., and the results of recent study of this subject have been combined in this article to help the plant operator—Page 193.

Vacuum Diatomite Filters for potable water treatment is an application of a new approach to diatomite filtration. Based on the idea of pulling the water through the diatomite by connecting the discharge side of the filter to a pump, this method offers several advantages over the conventional approach—Page 197.

Model Sewer and Water Planning—New Hope, Minn., provides a good example of community "growing pains" when an anticipated population explosion occurs. However, far-sighted planning by the village "fathers" not only solved the problem but turned it into a civic asset—Page 201.

Push Button Chemical Feeders—Philadelphia's Torresdale plant uses its available pneumatic instrumentation to automate its chemical feeders —Page 204.

Race Track Water Supply and Drainage tells how the problem of supplying water at the rate of 1000 gpm to meet the various demands of a modern sports area (covering 203 acres and serving 14,000 persons at one time) was solved—Page 207.

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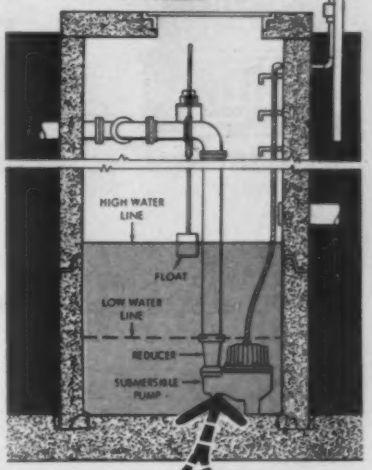

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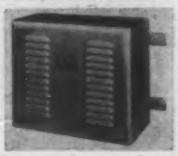

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Washington Viewpoint

Municipal water supply projects are not to be considered as "in interstate commerce", even though some of the water goes to manufacturers who, in turn, do produce products for sale in interstate commerce. That's the gist of a significant U.S. Supreme Court decision in an action brought by the Labor department against a construction contractor, on the grounds that the contractor (H. B. Zachry Co.) wasn't keeping proper records for wage-hour law purposes.

The Labor department had obtained a District Court injunction against Zachry, who was working under a $6 million contract to build a new storage dam for the Lower Nueces River Water Supply District, which supplies the Texas city of Corpus Christi. Labor attorneys argued that between 40 and 50 percent of the "product"—the water—goes to industrial users in Corpus Christi; hence those engaged in building the dam were engaged in producing "goods" for commerce; and that since water is essential to the industries, construction of the dam was "an occupation closely related and directly essential" to production.

In a majority opinion, the High Court upheld a reversal of the injunction on the grounds that: (1) building the dam could not itself constitute production of goods for commerce, regardless of the use to which the water might be put; (2) "remoteness" of the dam construction from eventual use of the water justifies exclusion of the workers from wage-hour coverage.

Interestingly enough, the Court commented that maintenance and repair of the completed dam might be assumed to be "covered" employment, just as maintenance and repair of a factory building has been declared to be. But—like a factory building which will not be put to production until construction men have completed their work—construction of the dam is too "remote" from production to be considered. If you want your lawyer to look into the details, the case was No. 83, on the Supreme Court's Appellate Docket.

☆ ☆ ☆ ☆ ☆

A major sewage treatment plant and its associated collection system, with a very definite international flavor, is in the works for San Diego, Calif. As proposed in a House bill (authored by Rep. R.C. Wilson of California), it would handle effluent from the Mexican city of Tijuana, in an attempt to end a pollution problem that has recently forced closing of many public beaches near San Diego. The bill (HR 9189) is a necessary preliminary to cooperation between the U.S. and Mexican governments.

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Use of the energy of nuclear explosions for blasting purposes—one of the purposes of the underground explosion tests to be held in New

Mexico next year—has a special interest for water supply officials. Scientists of the Atomic Energy Commission told a joint Congressional committee that two of their interests in the tests were: Possibility of creation of underground storage reservoirs, where evaporation and other losses could be minimized; and possibility of connecting underground aquifers with the surface for more efficient use. The AEC men told Congress that development of relatively "clean" nuclear explosives would make uses reasonably safe, and cheap.

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Racial details on hiring, firing, promotion or demotion of labor, will certainly be required shortly on most federal construction work, or on work in which the federal government has a financial or other interest (thus water and sewage work under federal grants-in-aid, for instance). Reason: "Recommendations" that such information be kept, by the President's Committee on Government Contracts, headed by Vice-President Nixon. Announcements that such a program was in effect, late in March were premature, but all federal construction agencies are holding meetings on the proposal in an effort to come up with uniform rules. It's certain, however, that prime contractors will be required to make regular reports (perhaps monthly) on racial details of their labor forces and have to take responsibility for subcontractors as well.

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Although there's little prospect that the measure will get anywhere, there's great interest among municipal officials, and those who do business with them, in that bill (S 3292) by Pennsylvania's Senator Clark, calling for establishing a cabinet-level Department of Housing and Municipal Affairs. The department would serve municipalities in the same way that Agriculture serves farmers and would consolidate housing, water supply, sanitation and similar matters now handled by a huge list of agencies and government departments. Of special interest is the evidence of growing Congressional sentiment in favor of such a department: The bill is almost a duplicate of one tossed in last session by New York's Senator Keating, except that Keating would have called it a "Department of Urbanization."

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If you get any gifts from business acquaintances—even if there was no obligation for the giver to make you the present—you would have to pay income taxes on it, if the Internal Revenue Service prevails in a group of three cases now before the U.S. Supreme Court. Said IRS (in a case involving the gift of an expensive automobile to a businessman who had referred possible customers to another), "the status of a voluntary gift that is excludable from gross income should be determined by the nature, not the intent, of the giver." If the motivation, thus is business, the payment is not a "gift".

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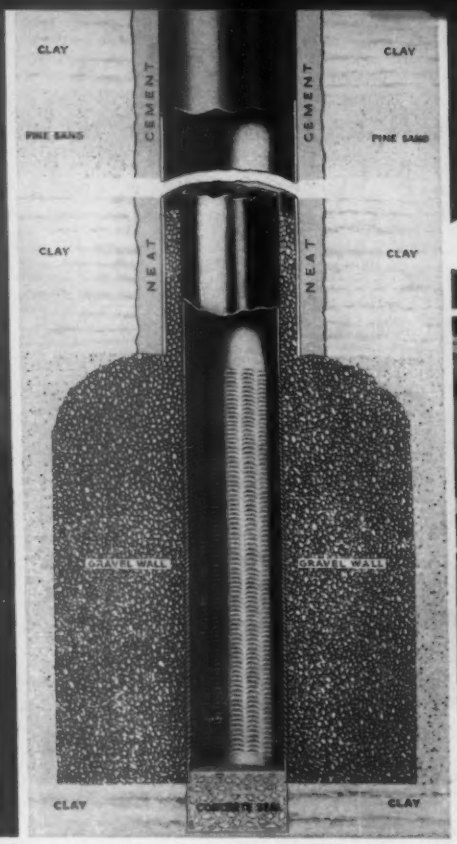
You haven't heard quite the last of appropriations for federal aid for stream pollution control, despite the President's successful veto (see April column) of a move to double authorized amounts available to communities. The House, in passing appropriations for HEW, approved $45 million for the program for Fiscal 1961—the same as in past years, despite the President's request for only $20 million for this purpose. Chances are that the bill will get Mr. Eisenhower's signature when it gets to him, since he won't risk the whole measure for this one point, and of course doesn't have to spend the money, even if it is appropriated.



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News—Here & There

Water Sanitation Research Conference

The Rudolfs Memorial Research Conference, conducted by Rutgers University, New Brunswick, N. J., June 6 to 8, will feature a technical session entitled, the Principles of Colloidal Behavior and Their Application to Water Sanitation.

Topics to be discussed fall into two groups. Part one, Principles of Colloidal Behavior includes, Heterogeneous Equilibria, Surface Kinetics, Adsorption and catalysis, and Gels—structure, hydration and dehydration, viscous and plastic flow properties.

Part Two, Application of Colloidal Behavior to Sanitation Problems, consists of, Water and Water Treatment, and Waste Water and Treatment.

Scarborough Conference on Sewage Purification

Some 650 sanitary engineers, chemists, managers and representatives of public utilities from many nations will meet at the Institute of Sewage Purification's annual conference to be held June 21-24, at Scarborough, England.

A number of interesting and pertinent papers will be read during the conference which is conducted so that those concerned with the problems of public sanitation and sewage can meet and exchange information and viewpoints.

Waste Water Control Gets Limitation

Missouri's State Attorney General, John M. Dalton, recently ruled that the State Water Pollution Control Board lacks control over waste or sewage water that does not reach a body of water.

This clarification of the Board's authority had been initiated by the Board's executive secretary, J. K. Smith, who explained that they had received many complaints concerning the discharge of wastes from industrial plants and private residences. It was noted that, usually, such wastes form pools in roadside ditches and seldom reach a river or other body of water except during occasional periods of surface runoff.

Dalton held that the board has no jurisdiction over such circumstances and conditions because the waste does not reach the waters of the state as defined in the 1957 law which created the board.

He further explained his position that "to impose upon the board with its . . . limited personnel, a task of policing the hundreds of thousands of individual residences of the state, would be a wholly impossible task and was certainly never the intention of the legislature."

Seattle To Try New Pipe Laying Method

The Seattle, Washington, Board of Public Works has authorized a test installation of laying concrete sewer pipe by a continuous, forced flow of concrete mix. The method could lead to "real economies" in storm sewer installations, according to City Engineer, Roy W. Morse.

The test installation will be for 492 feet of 30-inch pipe. City approval for the test installation had been requested by R. A. Hanson Co., Inc., an equipment manufacturer.

South Carolina Opposes Further Dam Construction on Savannah

The South Carolina legislature recently passed a resolution opposing further public power development of the Savannah River. The measure recommended that the United States Congress cancel plans for the construction of two additional power dams on the river, and asked the Army's Corps of Engineers to return to the public, through sale, all of the land areas situated above the high water of the Clark Hill Power Development.

Furthermore, the resolution pictured the Clark Hill project as a deterrent to the industrial development of the Savannah River valley in both Georgia and in South Carolina, unless this land were released.

Finally, the resolution declared that further dam construction would curtail already limited water supplies needed for the future industrialization of the area.

Larson Joins Berger Associates

Ernest O. Larson, one of the nation's leading reclamation engineers, has joined the consulting engineering firm of Berger Associates as its chief consultant. He has been assigned to the Salt Lake City office, located in the Continental Bank Building, but will be available to all of the Berger offices.

Mr. Larson recently retired from the U. S. Bureau of Reclamation after 37 years service. He was one of its pioneers, and, during his long federal service, planned and supervised the billion dollar Colorado River Storage project which has assured development and use of the limited water resources in the Upper Colorado River Basin.

European Course in Sanitary Engineering

A European Course in Sanitary Engineering is being organized by the Technological University at Delft and the Netherlands Universities Foundation for International Co-operation (NUFFIC) with the assistance of the Organization for European Economic Co-operation (Paris) and the World Health Organization (Copenhagen). The Course will be held from October 19, 1960, to September 14, 1961.

The aim of the Course is to provide civil engineers with special training in sanitary engineering to enable them to take part in the struggle with water pollution in the densely populated and highly industrialized area known as Western Europe.

The study will be based on a broad foundation of fundamental subjects like social backgrounds, hygiene, chemistry, microbiology and hydrology. These lectures will be followed by discussions of the scientific and practical aspects of modern groundwater recovery and water supply, storage and purification of sewage-water, and the disposal and disinfection of solid wastes. As these subjects cover a wide field, participants will be able to specialize further when choosing

CONTINUED ON PAGE 11A

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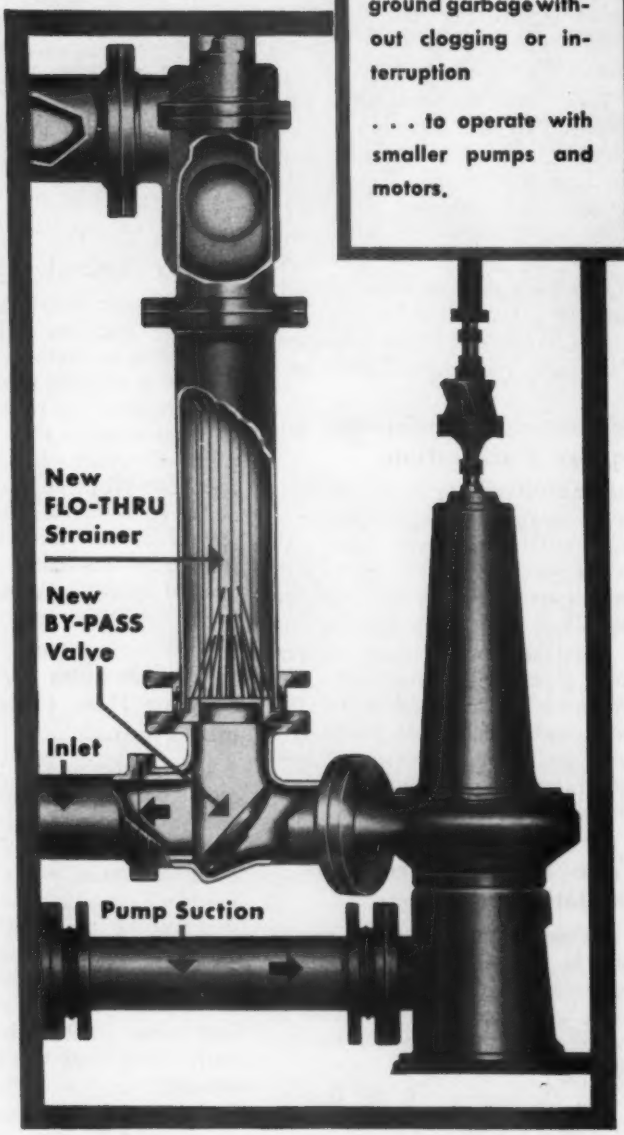

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News—Here & There

CONTINUED FROM PAGE 9A

subjects for the design exercises which deal with the details of either water supply or disposal of liquid and solid wastes.

The Course will be of 11 months' duration with instruction in the English language. It comprises lectures, practical laboratory courses, group discussions, design exercises, as well as a number of excursions to interesting sanitary works in Western Europe. The Faculty will consist of different European countries. A number of institutions in different European countries will also collaborate in the Course. Thus it is hoped to train European engineers.

At the end of the Course diplomas will be awarded to those participants who will have obtained sufficient results according to the Faculty Committee.

Wheelock Becomes EJC Head

Leroy K. Wheelock has been elected secretary of Engineers Joint Council, replacing Esworthy P. Lange who resigned to become executive secretary of the American Institute of Industrial Engineers, on March 1, 1960.

Wheelock has been assistant secretary of EJC since 1956 and, more recently, executive secretary of the Engineering Manpower Commission.

He is a member of the AIME, ASEE, Committee on Specialized Personnel, Office of Civil and Defense Mobilization and the National Defense Executive Reserve.

Ohio Conservancy Urged

The Ohio State Water Commission recommended the officials of the city of Columbus and of Franklin County to proceed with a conservancy district involving one to five counties. The commission stated it would not be prudent to wait until a proposed state law establishing watershed districts be passed.

Director Herbert B. Eagon of the State Division of Natural Resources said that local officials should make a move while public interest is high. He pointed out that a small conservancy district later could be incorporated into a larger watershed district.

Florida Commission Expands Water System

The members of Florida's Dade County Metropolitan Commission have voted to purchase four companies owned by the General Waterworks Corp. The selling price was set at $7,100,000.

These companies form the nucleus of what eventually has been planned to be a county-wide, county-owned water and sewer system. The firms are Consumer Water Co., Key Biscayne Water Co., Oakridge Utility Co., and Estates Water Co.

Later, the commission rejected an ordinance under which it would have taken over the city of Miami's water and sewer departments, largest in the county and the supplier to the four Metropolitan companies. However, Commissioner Robert Haverfield said this move would have caused ill will and would have disrupted current plans for the commission to take over the systems by mutual agreement. Haverfield noted that up to the present time, the city had shown a willingness to cooperate with the commission.

Recommends General Raise of Water Rates

Lauren Grayson, president of the American Water Works Assn., told 500 Illinois members convened for their 51st Annual Conference in Chicago's Pick-Congress hotel that "the waterworks industry in this country should spend an average of almost 1.5 billion dollars each year for new construction." This is practically four times the rate of $400 million spent in 1959.

He charged that low water rates—in most cities customers pay less for a thousand gallons of water than for a quart bottle of soda—have resulted in a situation where "the industry has not always been able to afford the facilities to assure all the water its customers need when and where they want it."

Illinois industry officials were further told that "one out of five U. S. water utilities are deficient in supply; two of five are deficient in transmission capacity; one in three lacks pumping capacity; two of five lack purification capacity; and three in five need to improve distribution systems."

Despite these shortages, "The safety of public water supplies in America is world renowned. No other country has supplies of such universally high quality."

He warned, however, that U. S. water utilities are confronted each year by "thousands of new pollutants —synthetic detergents, radioactive wastes, insecticides, and new chemical industry wastes" which "present new problems of maintaining quality tap water."

Grayson's address came in a wake of several national magazine articles which charged that atomic, industrial and biological pollutants have jeopardized water supplies in many parts of the nation, and a full-dress congressional debate over the question of growing pollution in U. S. rivers and streams.

A bill co-sponsored by Senator Hubert Humphrey and Representative John A. Blatnik, both of Minnesota, which would have hiked federal aid for pollution abatement activities was vetoed last Feb. 22 by President Eisenhower who recommended increased local support for cleaning up U. S. watersheds.

Harding Receives State Water Study Appointment

James C. Harding, Westchester Public Works commissioner, has recently been appointed a member of the Temporary Commission on Water Resources Planning by New York's Governor Nelson Rockefeller. The commission was created last year to study the practicability of establishing a comprehensive, multi-purpose planning program for the conservation, development and the most effective and equitable use of water resources on a statewide or regional basis.

Mr. Harding has served as public works commissioner since 1942; he is a past director of the A.W.W.A., and a past president of the Westchester Water Works Conference and the Westchester Chapter of the New York Society of Professional Engineers. Twice he has been cited by the A.W.W.A. for distinguished service in the water supply field.

liquid level automatically controlled

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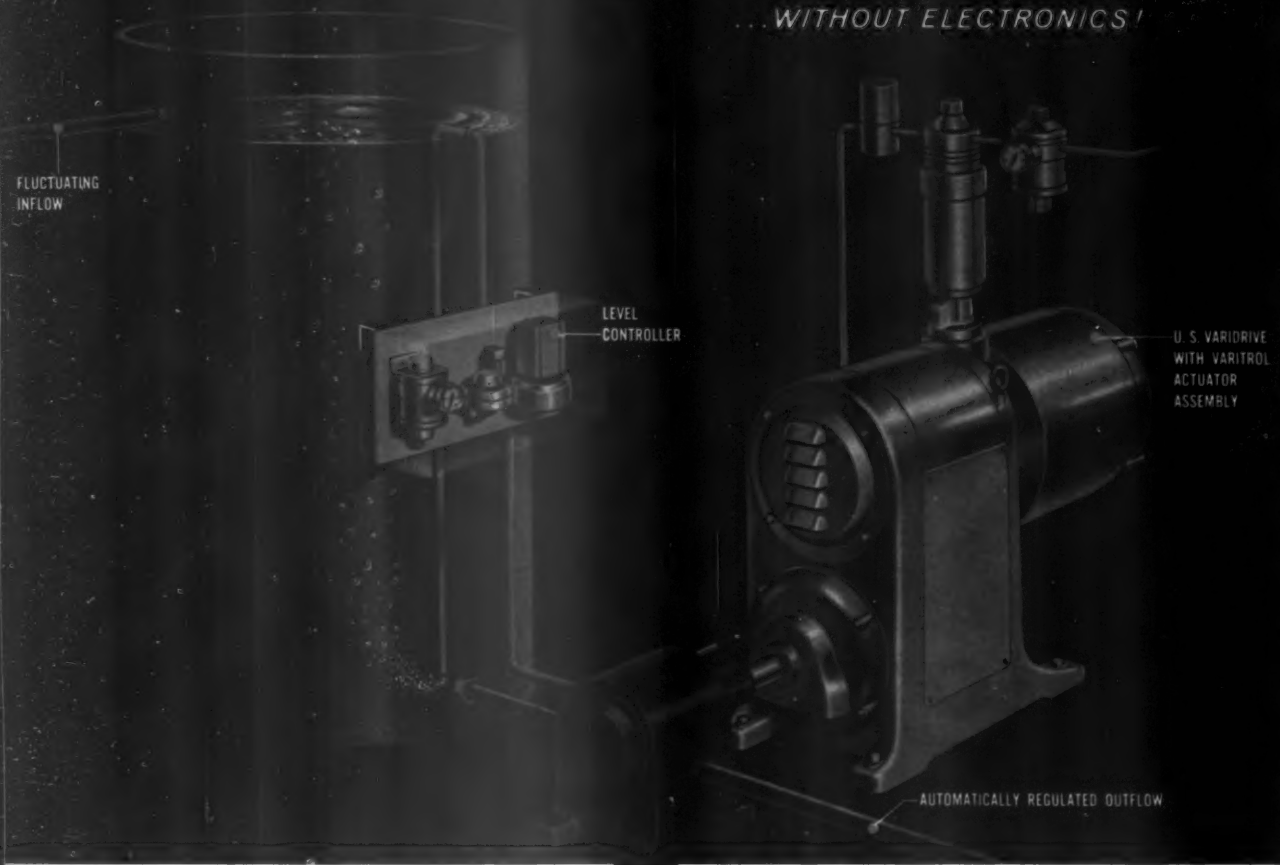
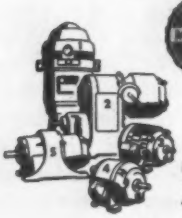


using adjustable speed U.S. Varidrive

with VARITROL *automatic speed control*

This U.S. Liquid Level Control System adjusts pump motor speed to maintain constant level in open tanks such as those used in food, petroleum, sewage or chemical processing industries. Pumping is continuous. Level can be held as close as ¼" when necessary. No electronic circuitry, no special technicians required to maintain and operate equipment. Many other U.S. controlled speed systems with U.S. Varidrives regulated by Varitrol are available for production involving gases, liquids or solids. Write for brochures.



U.S. ELECTRICAL MOTORS INC.

P. O. BOX 2058
LOS ANGELES 54, CALIFORNIA
OR MILFORD, CONNECTICUT

U.S. MAJOR MOTOR LINES INCLUDE:
1. Vertical Solid & Holloshaft, 2. Varidrive, 3. Totally-Enclosed, 4. Uniclosed, 5. Syncrogear. Also, many other special motors.

FREE ILLUSTRATED BROCHURES ...*send for Controlled Speed Systems Bulletin F-1953; Varitrol Bulletin, F-1882; Varidrive Bulletin, F-1797.*

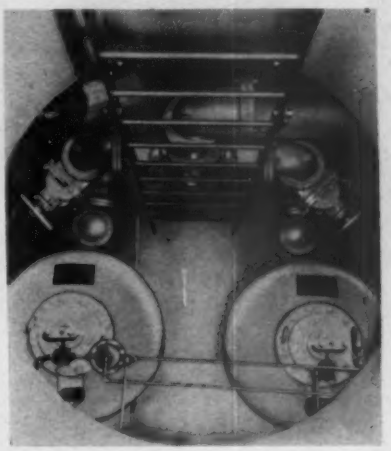
Equipment News

Welded Steel, Prefabricated Sewage Pumping Station

501

Komline-Sanderson Engineering Corporation, Peapack, New Jersey, is currently offering a factory assembled, welded steel, prefabricated sewage pumping station incorporating either pneumatic sewage ejectors or standard sewage pumps. The stations are fabricated of 3/8" thick steel for the wall sections and 5/8" for top and bottom plates. Over-all stations include access ladders, well balanced and easily opened hinged doors, lights, dehumidifier, blower and sump pump.

In ejector stations, heavy-duty cast iron pots are utilized with either electrode or pneumatically operated liquid level controls. The use of cast iron pots makes the station flexible in the use of any one of three different types of available control systems. Welded steel ejector electrode controlled pots are integrally fabricated with the steel shell of the station in either single or duplex types. Separate air receivers are



utilized when required. Ejector stations including two pots as large as 300 gallon capacity have been manufactured.

Pumping stations incorporate vertical "non-clog" centrifugal pumps having latest innovations of gland seals and bubbler-type control systems for the adjacent wet well.

The station walls are coated with epoxy resin type coatings after careful preparation. Special electric control panels, completely inter-wired at the plant, spring loaded check valves and inlet and discharge pipe connections extending outside are standard items. Stations as high as 19-ft. have been manufactured and shipped in one piece to job sites from the factory at Peapack.

Pipe Thawing Unit

502

Hobart Brothers Co., Troy, Ohio, has announced the availability of a new, transformer type pipe thawing unit, called the Porta-Thaw, which will operate on ordinary house current of 110 or 220 volts, single phase, 50 or 60 cycle, AC, and which can be carried by one person.

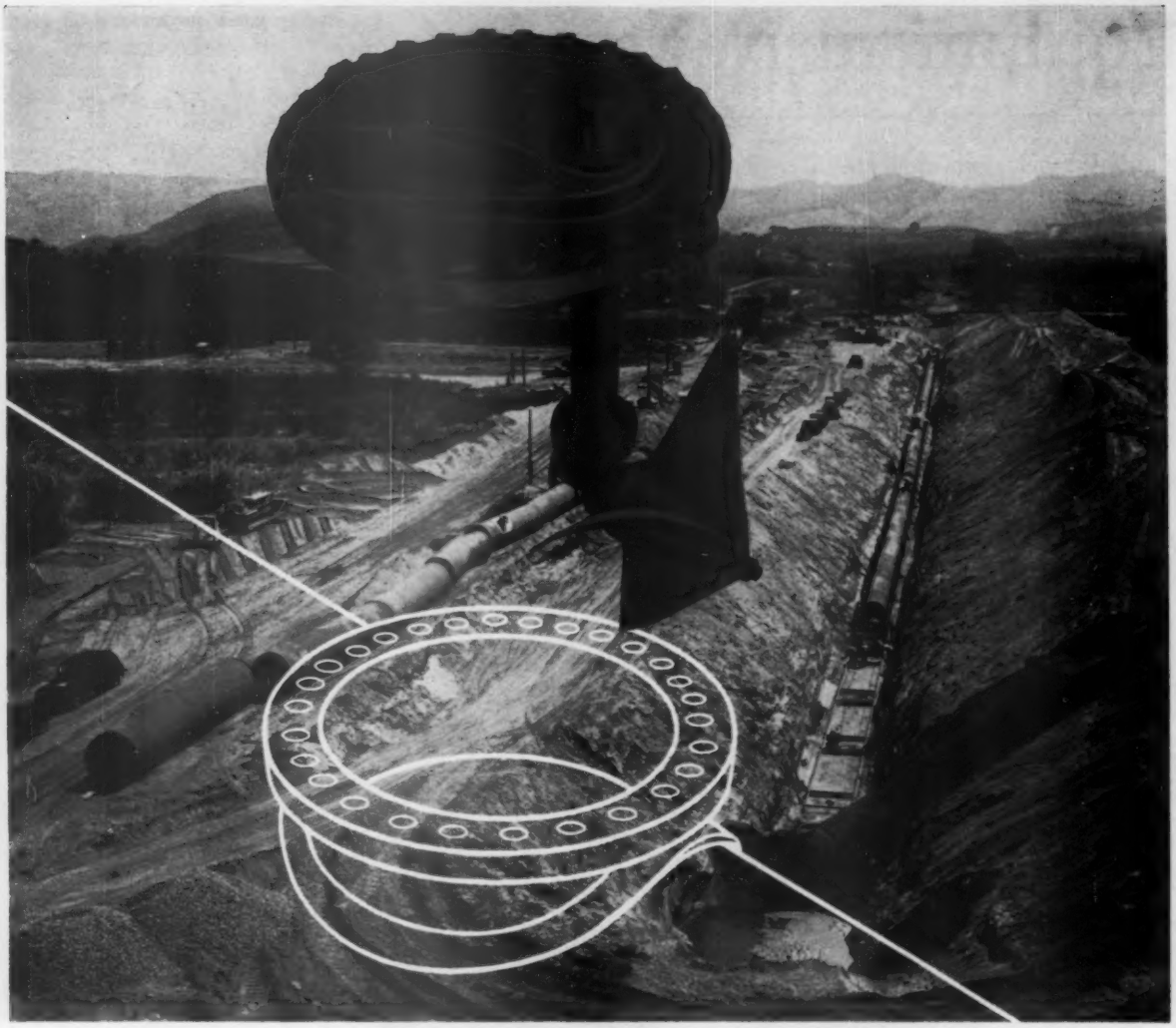
The output rating of the unit is 300 amperes, 10 volts on a 100 per cent duty cycle. Safe operation is assured because there are no electrical connections between the power line and the output terminals.

CONTINUED ON PAGE 17A

McDONALD'S 104 YEARS OF EXPERIENCE STAND BEHIND THIS PRODUCT

McDonald 4701 Corporation Stop—Standard A.W.W.A. thread for copper service pipe. Sizes from ½ inch to 2 inches. A catalog of McDonald's complete line of brass goods is available on request.

A. Y. McDONALD MFG. CO., Dept. WS-560, 12th & Pine, DUBUQUE, IOWA • Brass Goods • Pumps • Oil Equipment • Drains



quick, easy installation... **SPARLING *906* METERS FIT STANDARD MANHOLE OPENINGS**

Meter installations on large pipe lines are simple with the Sparling **906** meter.

Unique design of the meterhead utilizes *standard* flanged manhole openings on new or existing pipe 16" to 72", including steel, reinforced concrete, and steel cylinder concrete. This use of standard flanged outlets cuts cost of new pipe construction, and saves time and money on installations in existing lines. Where required, steel saddles and mounting skirts can be furnished to pipe manufacturer's specifications.

The Sparling **906** meterhead is complete. The propeller assembly slides directly through the opening and the meterhead is quickly and easily bolted into position ready for immediate use. Total flow is registered on a 6-digit, straight-reading totalizer. Accuracy is guaranteed within 2%.

Call your Sparling representative, or write for technical bulletin CF 365-1.

In addition to the *906*, Sparling saddle meters are available in a complete range of sizes and working pressures for bolting, welding or wing and U-Bolt applications.

SPARLING
WATER CONTROL EQUIPMENT
Hersey-Sparling *Meter Company*
225 N. Temple City Blvd., El Monte, California

HERSEY PRODUCTS: Dedham, Mass. • SPARLING EQUIPMENT: El Monte, Calif.
Branches in: Atlanta • Chicago • Cleveland • Dallas • Denver • Kansas City, Mo. • Roselle, N. J. • San Francisco • Seattle
United Kingdom Affiliate: TYLORS OF LONDON LTD.

Naugatuck KRALASTIC

HOUSEHOLD STACK VENTING

Easiest to install of all stack venting!

LONGER LENGTHS • FEWER JOINTS • PRE-ASSEMBLY SAVES TIME • SAVES SPACE

KRALASTIC® venting is the easiest to install of piping. It is light in weight—one man can lift and connect a length where, with ferrous metal, it would take more time and more men. No heavy equipment for threading or caulking. Can't rust, can't corrode. Diameters up to 6 inches.

Don't waste money on your venting system. Specify KRALASTIC, the original ABS plastic. Write, wire or phone us if unable to locate immediate source of supply.

United States Rubber

Naugatuck Chemical Division

554K ELM STREET
NAUGATUCK, CONNECTICUT

KRALASTIC RUBBER-RESINS • **MARVINOL** VINYLS • **VIBRIN** POLYESTERS

Akron · Boston · Chicago · Gastonia · Los Angeles · Memphis · New York · Phila. · CANADA: Naugatuck Chemicals · Elmira, Ont. · Cable: Rubexport, N.Y.

What Every WATER SUPERINTENDENT Should Know About

AMERICAN METERS

...Simplicity

Unequalled simplicity and accessibility of working parts are features of American Meters that reduce maintenance costs. The ease with which the internal gears may be lifted from their bearings or the disc chamber taken from its seat and opened is a revelation to anyone who has not seen it. And, best of all, you can't put the parts of an American Meter together incorrectly. They just won't fit in the wrong place.

American Meters have full interchangeability of individual parts, which permits the low cost rebuilding of worn meters without buying expensive replacement "unit assemblies".

Combine all this with the finest materials and workmanship and you have the reason why water superintendents who know American Meters continue to purchase more, year after year.

All the cost-saving features of American Meters are described in Bulletin 58. We will be glad to mail you a copy on request.

BUFFALO METER COMPANY
INCORPORATED

2909 Main Street **Buffalo 14, New York**

Equipment News

CONTINUED FROM PAGE 13A

Measurement Indicator Also Functions as Transmitter

503

Hays Corporation, Michigan City, Indiana, has announced its new, Model 231, indicating transmitter for low-to-medium pressures which can be located to provide pressure indication at the point of measurement, or within 300 feet, on an easy-to-read dial.

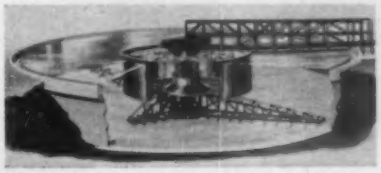
Moreover, this same unit can simultaneously transmit the pressure measurement electrically to any Hays remotely located recorder or indicator. This combination provides the operator with the flexibility of having the pressure indication exactly at the point where the process is being measured and still be able to record and indicate that same measurement on a panel board or control center at a distant location.

The unit's application is for the measurement of pressure (or draft), differential pressure (flow) of air or non-corrosive gases, ranges from 0-0.2 inches to 0-120 inches water, and for static pressure to 65 psig. It has additional flexibility in that field conversions can be made easily from pressure to suction or to differential service.

Circuline Sludge Collectors

504

Link-Belt Company, Chicago, Ill., is offering two new series of Circu-



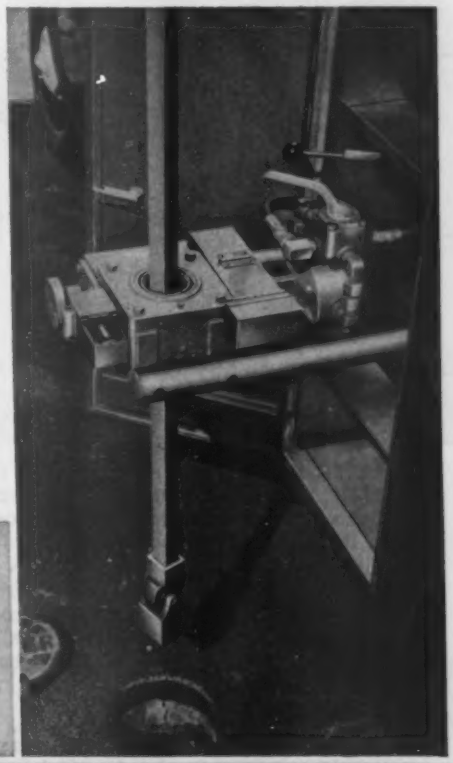
line sludge collectors for water, sewage and industrial waste treatment settling tanks. The new additions extend the company's line to six series and fifteen types of Circuline collectors.

The new Series U is a Uniflow settling tank with a rapidly sloping bottom, tank-type sludge collector and multiple effluent weirs, and is designed to save construction costs because its sloping bottom permits the volume of the tank to be reduced 25 per cent or more without reducing the surface area or overflow rate.

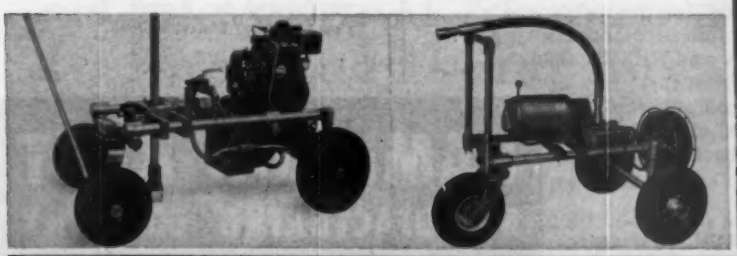
The new series A is an aeration sludge collector for pre-aeration and settling. It consists of a single circular tank in which both aeration and settling are accomplished. The collecting mechanism removes the solids from both the aeration compartment and the settling compartment. These collectors are built in two types: Type AP for preliminary aeration of 30 to 60 minutes, and Type AT for total aeration with extended aeration with extended aeration up to 24 hours or more. Pre-aeration is an efficient and economical method for increased removal of grease, suspended solids and biochemical oxygen demand (B.O.D.) from sanitary sewage and industrial wastes.

CONTINUED ON PAGE 20A

HYDRAULIC TRUCK MOUNTED VALVE OPERATORS PROVIDE ONE MAN CONTROL OF VALVES FROM 10" TO 60" SHIPPED FULLY ASSEMBLED, FOR MOUNTING IN ANY MAKE OF TRUCK BY YOUR OWN MECHANICS, WITHIN A FEW HOURS. HAS SAFETY DEVICE FOR DAMAGE PROTECTION ALSO POSITION INDICATOR.



PORTABLE 3-10 HP. ELECTRIC DRIVE



Makes EVERY VALVE Power Operated. Payne Dean & Co. Clinton, Conn.

In KNOXVILLE, TENNESSEE

TYLOX Rubber GASKETS, REXON Rubber GASKETS, and REXON PIPE COATING

PREVENT JOINT LEAKS, WHIP ACID ATTACK AND SPEED PIPE LAYING ON STORM-SANITARY SEWER PROJECT

Engineers and city officials went "Hamilton Kent" all the way, in the matter of selecting *leak-proof* pipe joints and *acid-resistant* pipe coating to protect Knoxville's new Riverfront-Willow Avenue sewerage and drainage project . . .

Heavy duty precision TYLOX Gaskets coupled the large diameter T & G concrete storm lines. REXON "K" Light Duty Gaskets jointed the smaller diameter B & S sewer lines, and tough, non-deteriorating REXON No. 2 Pipe Coating put a protective covering inside all lines that would serve nearby stockyards, butchering plants and other industrial installations.

In specifying Hamilton Kent TYLOX and REXON *rubber* Gaskets, and REXON Pipe Coating, engineers and city officials not only provided to the utmost for the safety and long life of the system, but made possible substantial savings in construction costs . . . Both TYLOX and REXON Gaskets are quickly assembled to pipe, and permit fast assembly of the line. Their flexible, *compression* seal compensates for pipe angularities, allows wet trench coupling, and immediate backfilling.

WRITE FOR BROCHURES describing and illustrating use of Hamilton Kent TYLOX and REXON Gaskets and REXON Pipe Coating. Specify these products to protect your pipe projects from leakage and acid attack.

PROJECT: For City of Knoxville, Tenn., Riverfront-Willow Ave. storm and sanitary sewers.

ENGINEERS: H. R. Neal, City Engineer, and Roy I. Gentry, Service Director.

CONTRACTORS: Division A—Harrison Construction Company, Alcoa, Tenn. Division B—Blant Brothers Construction Company, Montgomery, Ala.

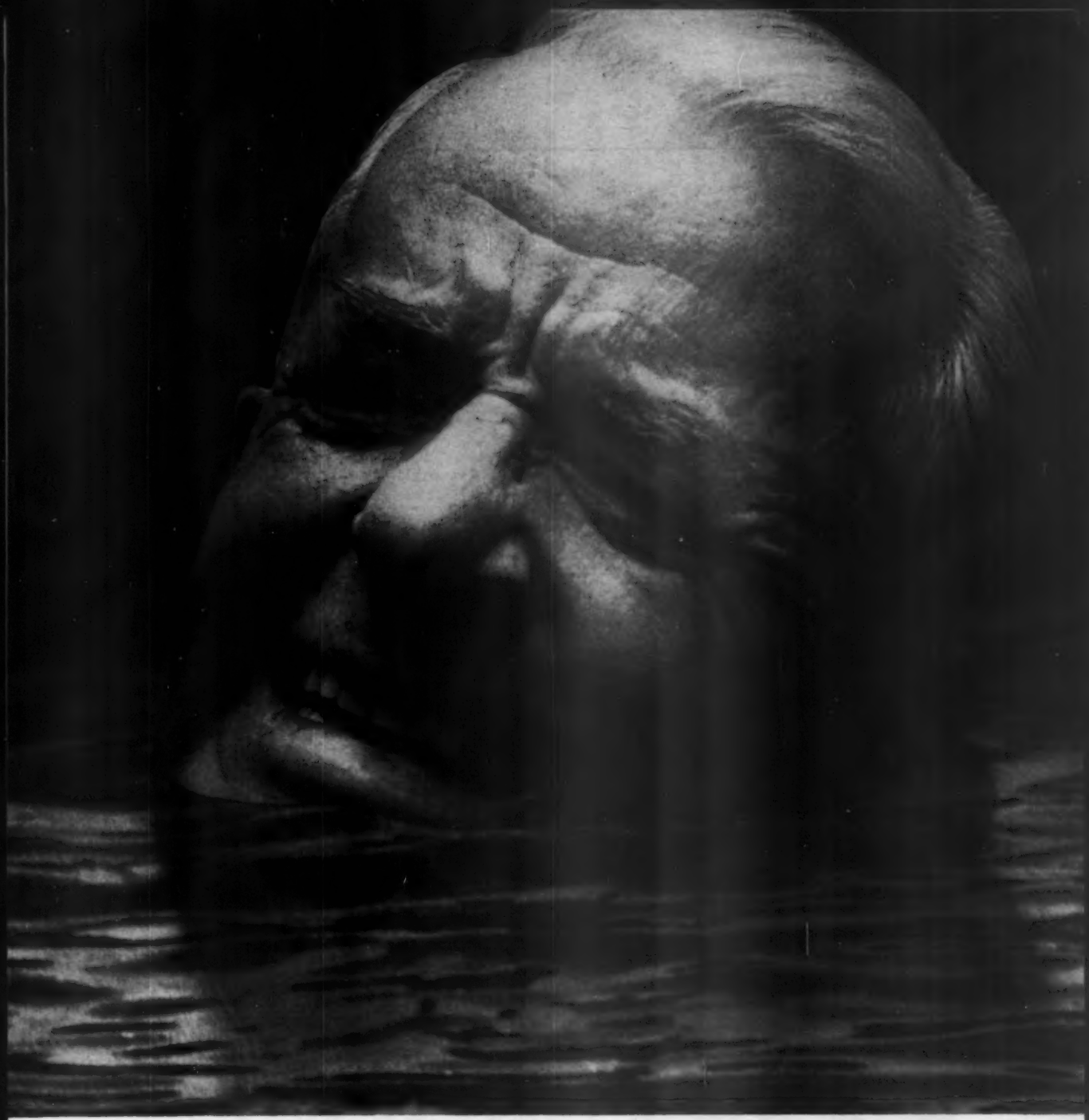
PIPE: T & G and B & S Concrete Pipe, manufactured by Sherman Concrete Pipe Company, Knoxville, Tenn.

5089

HAMILTON KENT MANUFACTURING COMPANY

KENT, OHIO

427 West Grant Street Orchard 3-9555



"I screamed for pump service and they send me a salesman!"

"40-dozen housewives . . . the mayor . . . and every important business man in town on my back and the manufacturer sends out a *salesman* to fix my pump. That beats anything I ever heard . . . expecting a salesman to double as a serviceman . . . I need a man who knows pumps and *fixes pumps* for a living. I need him bad . . . RIGHT NOW!"

Trained service . . . one of the many inherent qualities you are given when you buy Allis-Chalmers. Industrial Equipment Division, **Allis-Chalmers,** *Milwaukee 1, Wisconsin.* A-1243

ALLIS-CHALMERS GIVES TRAINED SERVICE

At Allis-Chalmers, the servicemen "service" and the salesmen sell. Every regional office has available a network of specifically factory-trained men to service pumps "on the spot." Certified Service Shops can rebuild equipment quickly . . . save you transportation expense and time. When you call for service, you get service . . . from servicemen. The quickest and best offered by any pump manufacturer.

Equipment News

CONTINUED ON PAGE 17A

Compressors Feature Simplicity in Design

505

Davey Compressor Company, Kent, Ohio, have introduced their 1960 line of compressors that are designed for ease of installation utilizing a minimum of space without complicated engineering, special machinery rooms or foundations.

The units are completely enclosed and have no exposed belts or couplings. Because they have fifty per cent fewer working parts than many compressors of similar capacities, they are both lightweight and compact. Only a small outlet is needed for the 180° discharge air, and users have the option of air-cooled or water-cooled units.

Submersible Sewage Pump

506

The Deming Company, Salem, Ohio, has announced the introduction of the firm's new Demersible Sewage Pump. This new pump is a submersible unit, combining the pump and motor in one compact, complete unit. The motor is totally sealed and oil-filled in a cast iron case.

The Demersible can be quickly installed for temporary service or permanently set for continuous service, and its controls can be located in any convenient place. It is furnished with 30 feet of waterproof cable. The pumps have capacities from 25 gpm to 800 gpm.

Construction-wise, the pump has a semi-open type impeller with a precision bore for perfect alignment. These feature a self-cleaning action on the suction head face, and are keyed for positive drive. Both pump and motor shafts are made of stainless steel.

Bearings in the new pump are the heavy-duty, ball thrust type, self-lubricated and sealed in the motor; they are sized to impeller loads. They have positive protection against outside moisture and dirt. The base and strainer are made of high grade cast iron. Float or electrode type controls are available.

Other equipment includes single pump float switches; drip-proof switches; totally enclosed switches, alternator float controls; totally enclosed alternators; high water alarms; and magnetic starting equipment.

Under-Road Boring Machine

507

Young Engine Corp. Canton, Ohio, has designed and produced an under-

CONTINUED ON PAGE 28A

STEVENS
TOTAL FLOW METER
Model 60M

Low-cost meter provides essential flow data for operation of sewage treatment plants

- **INDICATES FLOW**—Rate of flow and head are indicated by pointer and scale.
- **INDICATES PEAK FLOW**—Sliding red index on scale indicates peak flow.
- **TOTALIZES VOLUME**—Counter totalizer registers total flow.

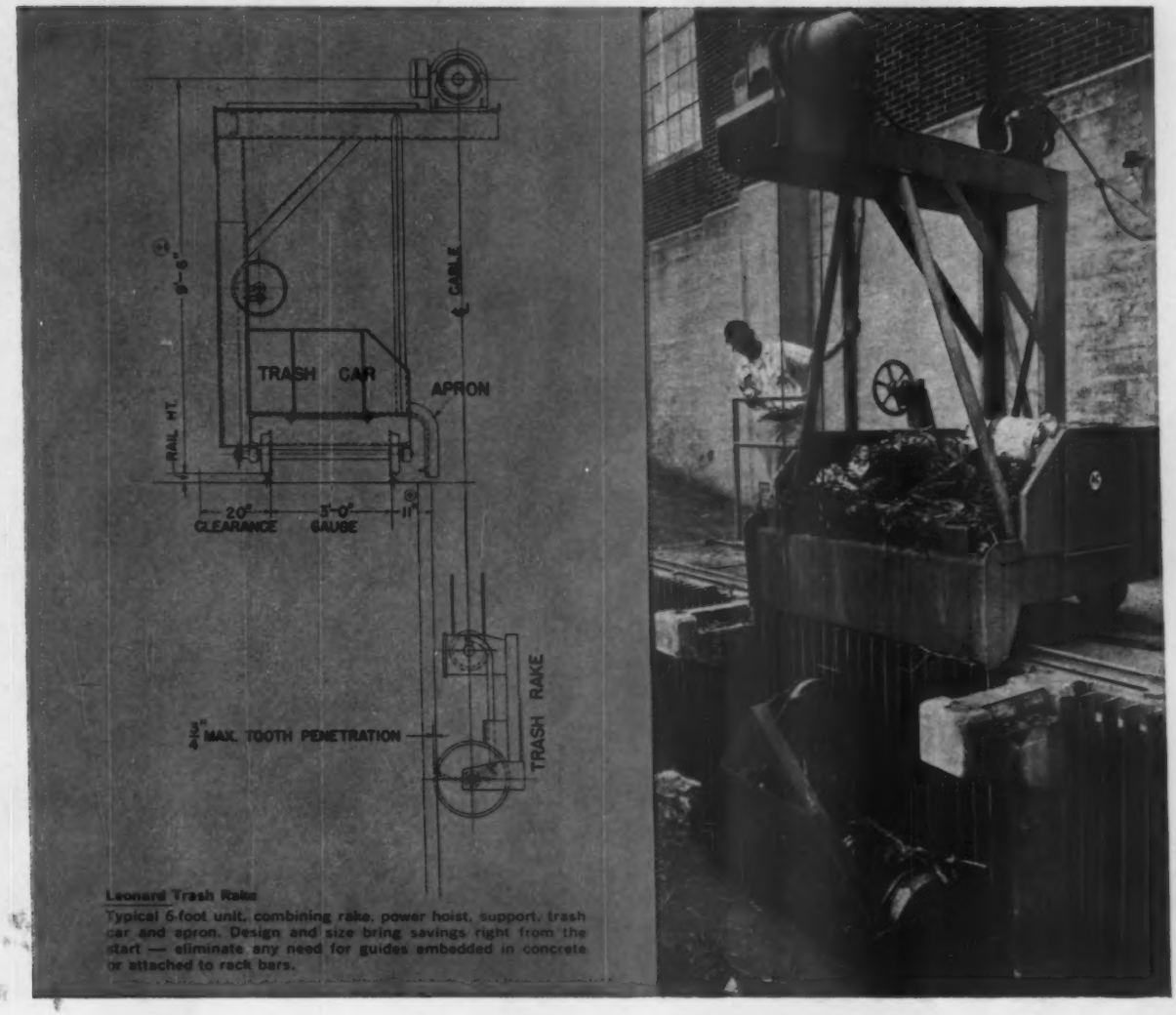
Mechanically operated meter provides essential data in measurement of sewage, industrial wastes, irrigation water or other liquids flowing in open channels. Standard meter gives direct flow reading in cu. ft./sec. and totalizes volume in cu. ft. Readings are easily converted to other units of measurement.

The instrument is designed for use with Parshall flumes and various weirs. It is entirely mechanically operated, will function without attention for eight-day intervals, and is easy to install on table, shelf or wall. If a graphic record is desired, the meter can be used with a Stevens Type F Recorder. Write for Stevens Hydrologic Instrument Short Form Catalog No. 23, and for Bulletin 28 which describes the Model 60M meter in detail.

HYDROGRAPHIC DATA ... file, 124 pages of technical data on recorder installations, plus a wealth of hydraulic tables and conversion tables. $1 copy. (No C.O.D.'s)

LEUPOLD & STEVENS INSTRUMENTS, INC.
4445 N. E. Glisan Street, Portland 13, Oregon
... hydrologic instruments ... century

ALLIS-CHALMERS



Leonard Trash Rake
Typical 6-foot unit, combining rake, power hoist, support, trash car and apron. Design and size bring savings right from the start — eliminate any need for guides embedded in concrete or attached to rack bars.

Cleans up costly head losses

. . . rakes-in savings enough to pay for itself!

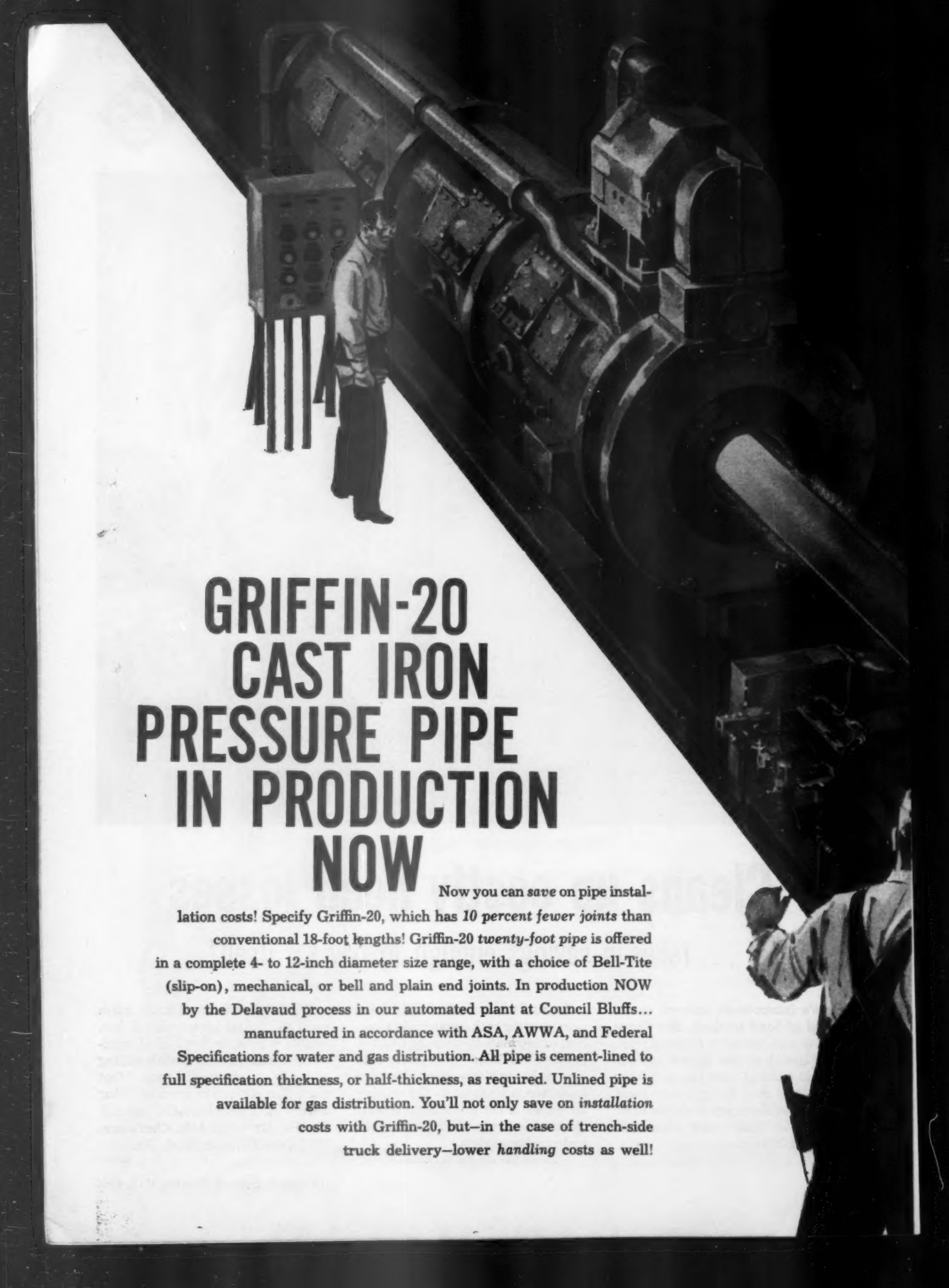
Here's intake-trash removal so far ahead of hand methods that *"once sold is sold forever!"* *Leonard* trash rake installations deliver savings both in reduced head loss and labor costs. And they bring a permanent solution to shortages of people to do the job — make trash removal a one-man operation.

Leonard **trash rakes roll right down your existing rack bars whether vertical or inclined. Because no channel guides are needed, they freely ride over stubborn obstructions, dig them loose, scoop trash up to the waiting receptacle or car. Self-dumping units also are available—both log-grapple and regular models.**

Leonard is an Allis-Chalmers trademark.

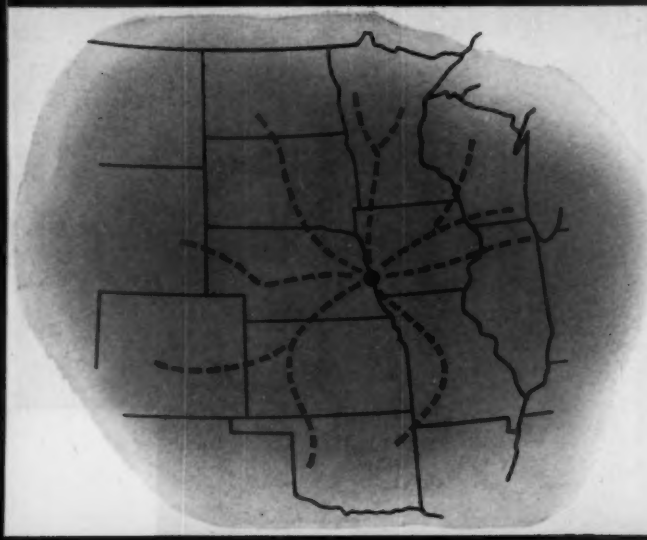
With Allis-Chalmers trash rakes even the initial investment is low. Width is held to the logical minimum required for adequate handling of trash . . . standard 6- and 8-foot sizes. Larger units special. Your nearby A-C representative has full details. Or write Allis-Chalmers, Hydraulic Division, York, Pa.

A-1307



GRIFFIN-20 CAST IRON PRESSURE PIPE IN PRODUCTION NOW

Now you can *save* on pipe installation costs! Specify Griffin-20, which has *10 percent fewer joints* than conventional 18-foot lengths! Griffin-20 *twenty-foot pipe* is offered in a complete 4- to 12-inch diameter size range, with a choice of Bell-Tite (slip-on), mechanical, or bell and plain end joints. In production NOW by the Delavaud process in our automated plant at Council Bluffs... manufactured in accordance with ASA, AWWA, and Federal Specifications for water and gas distribution. All pipe is cement-lined to full specification thickness, or half-thickness, as required. Unlined pipe is available for gas distribution. You'll not only save on *installation* costs with Griffin-20, but—in the case of trench-side truck delivery—lower *handling* costs as well!



Strategically located to effect savings in shipment *time* and *money*, the Griffin-20 Council Bluffs plant (95,000 square feet of buildings on 19 acres of land) is at the *transportation hub* of the Plains States. Pipe shipments reach their destinations in record time because the site is served by nine major railroad carriers, in addition to truck carriers. *For the first time, many areas can receive truck delivery alongside trench.* Griffin-20's Council Bluffs plant is the *logical* source for cast iron pressure pipe users throughout the Midwest and Rocky Mountain states.

GRIFFIN PIPE DIVISION

Griffin Wheel Company · Council Bluffs, Iowa

SALES OFFICES: Chicago · St. Paul · Kansas City, Kansas · Denver

GRIFFIN PIPE DIVISION
COUNCIL BLUFFS

Badger
Read-o-Matic
the only
self-powered meter-register
you can read outdoors
All Badger models can be equipped with the Read-o-Matic, for economical meter reading at conveniently located stations.

From Badger's "meter-ology" specialists...

a complete line of disc, turbine, compound and propeller meters for any high-accuracy job

For over 55 years, Badger has concentrated its research, design, development and production on meters. This "meter-ology" specialization has brought about many of the most important advances in the field.

Badger disc meters, for example, feature the exclusive dovetail thrust roller insert as standard equipment. This insert cuts wear and noise at the water level, and guarantees more accurate registration.

Our propeller meters, too, offer a major design advantage: they can be mounted even in an inclined position without affecting meter accuracy.

Still big news is the revolutionary Read-o-Matic outdoor meter-register — a completely new product that further proves Badger's "meter-ology" leadership.

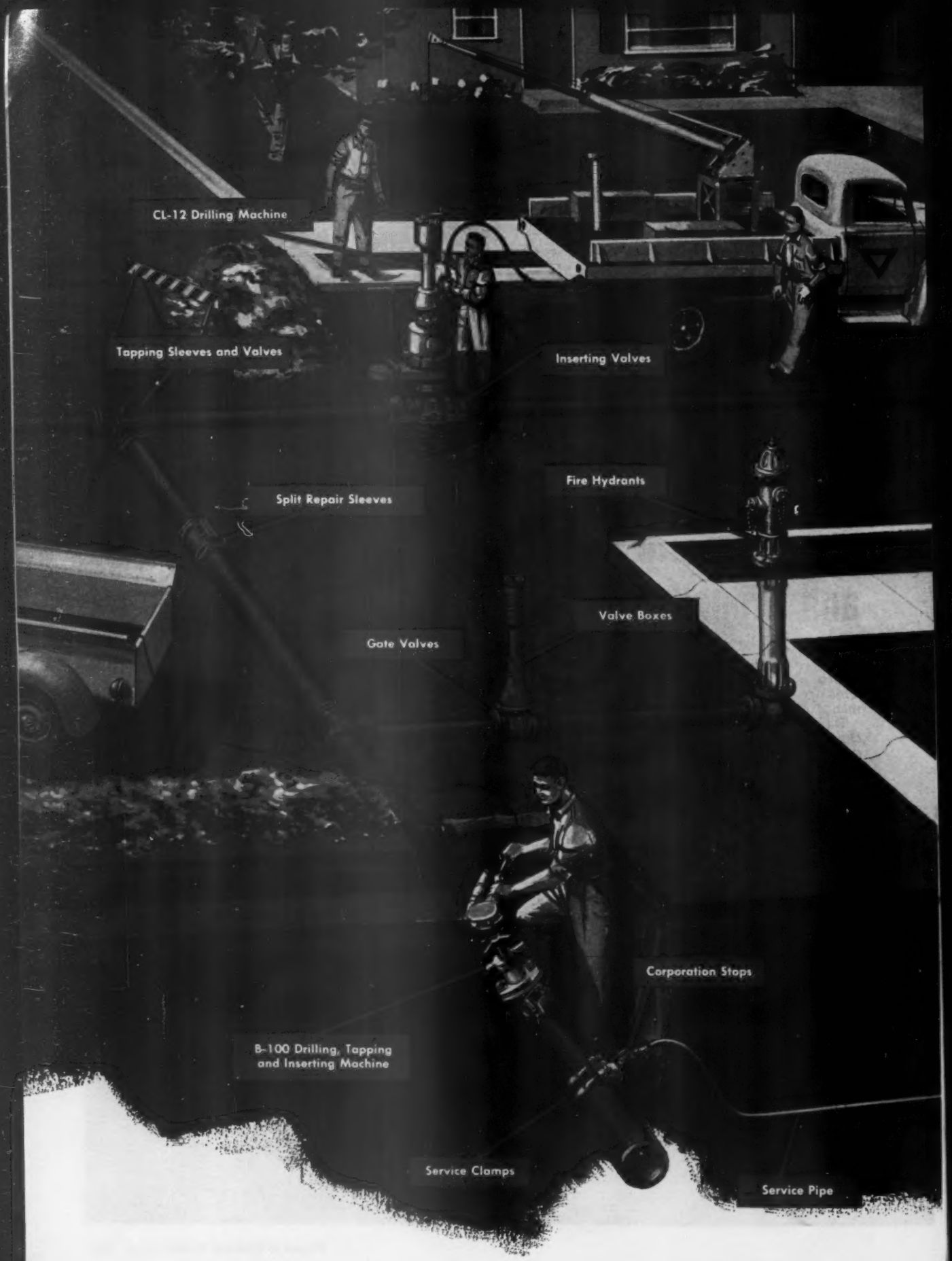
Your Badger representative — a "meter-ology" specialist himself — will give you complete details on our whole line of meters, including the popular models shown here. Ask him to call on you soon.

Badger Meter Mfg. Company

MEASURE-RITE, INCORPORATED, SUBSIDIARY

4545 West Brown Deer Road, Milwaukee 23, Wisconsin

*Pat. applied for in U.S.A. and foreign countries


CL-12 Drilling Machine
Tapping Sleeves and Valves
Inserting Valves
Split Repair Sleeves
Fire Hydrants
Valve Boxes
Gate Valves
Corporation Stops
B-100 Drilling, Tapping and Inserting Machine
Service Clamps
Service Pipe

it's MUELLER®

all along the line

Gain longer, more dependable service with reduced maintenance costs. Insure uniform product quality and reduced costs by utilizing one source of supply.

Specify the complete line of water works products—equipment backed by over a century of manufacturing experience and technical "know how".

Specify Mueller, all along the line.

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

Equipment News

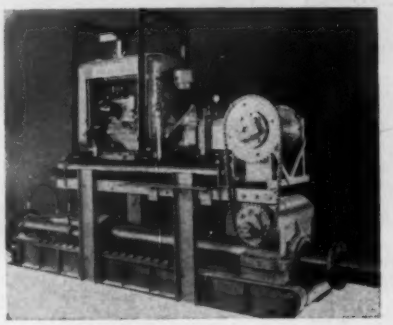
CONTINUED FROM PAGE 20A

road boring machine for the installation of pipe under streets, highways and railroads. The new model is now made with the power unit mounted directly above the boring unit.

Its 35 horsepower power unit, with 4-speed transmission and reverse, is mounted on its own pipe skid base and is easily removed from the boring unit when desired.

The machine operates on the rotary drilling principle. It bores and installs, in one operation, casing 6″ to 30″ in diameter, and in limited lengths 36″ diameter casings. A renewable, hard-faced cutterhead is attached to the front end of the casing. This casing is rotated by the boring machine and is pushed forward by two hydraulic cylinders. Additional lengths of casing are welded on as boring progresses.

The unit is designed to bore accurately through sand, gravel, clay, slate, concrete, timbers and rocky formations.



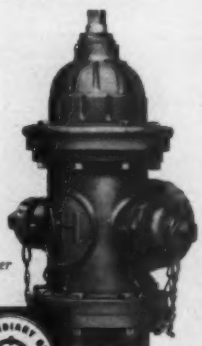
The Importance of People

The future of U. S. water supplies rests largely with the American public. The knowledge of the hydraulic engineer, the skill of the operating mechanic, the craftsmanship of the manufacturer who makes water works supplies – these can function only as authorized to do so by the general public. Water works have become mostly public utilities. Water works improvements are therefore done with public funds, and it is the people who say yes or no.

Perhaps the greatest handicap in development of water supplies for over three-quarters of a century is the public opinion that water is cheap, simply because in pioneer days well water and spring water were free. This popular misconception has kept water rates too low to finance improvements as needed. Result: A 30-year-period of delay and a $41 billion deficit in funds for water works and sewage works construction needed to meet today's requirements.

"Where there is no vision, the people perish," says an Old Testament Proverb. The first and the biggest job of water works men and city officials now is to inspire vision in the people of their community. Once they know the facts, the people will act for their own welfare.

This series is an attempt to put into words some appreciation of the water works men of the United States.



M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA
SUBSIDIARY OF WALWORTH

Water Meter Has Increased Capacity

508

Rockwell Manufacturing Company, Municipal and Utility Division, Pittsburgh, Pa., has introduced its new, larger capacity, magnetic drive sealed register water meter, a one inch model that has a capacity of 50 gpm.

These new meters feature: a hermetically sealed register; a magnetic drive designed to eliminate the need for a stuffing box, an exposed intermediate train and a driving dog; and the use of the oscillating piston principle to provide long life and accurate measurement.

The entire unit contains only fifteen stock parts of which only two moving parts operate in contact with the water. Straight reading registers, calibrated in cubic feet or gallons, with a center sweephand are a standard part of the equipment.

Potentiometer Recorder for Laboratories

509

Bristol Company, Waterbury, Connecticut, is now offering a new laboratory model of its Dynamaster potentiometer recorder. This new instrument, basically a wide-strip recorder, lends itself readily to measuring such variables as pressure, temperature, motion, flow, density, pH, and electric power.

Special input signal selection switches and span adjustments provide maximum flexibility, and a four-position input selector switch provides for millivolt, volt, microampere, milliampere input. A five-position span selector allows a range offering of 0-2, 0-5, 0-10, 0-25, and 0-50. In addition, an alternate span continuously adjustable from 0-2 to 0-50 is available.

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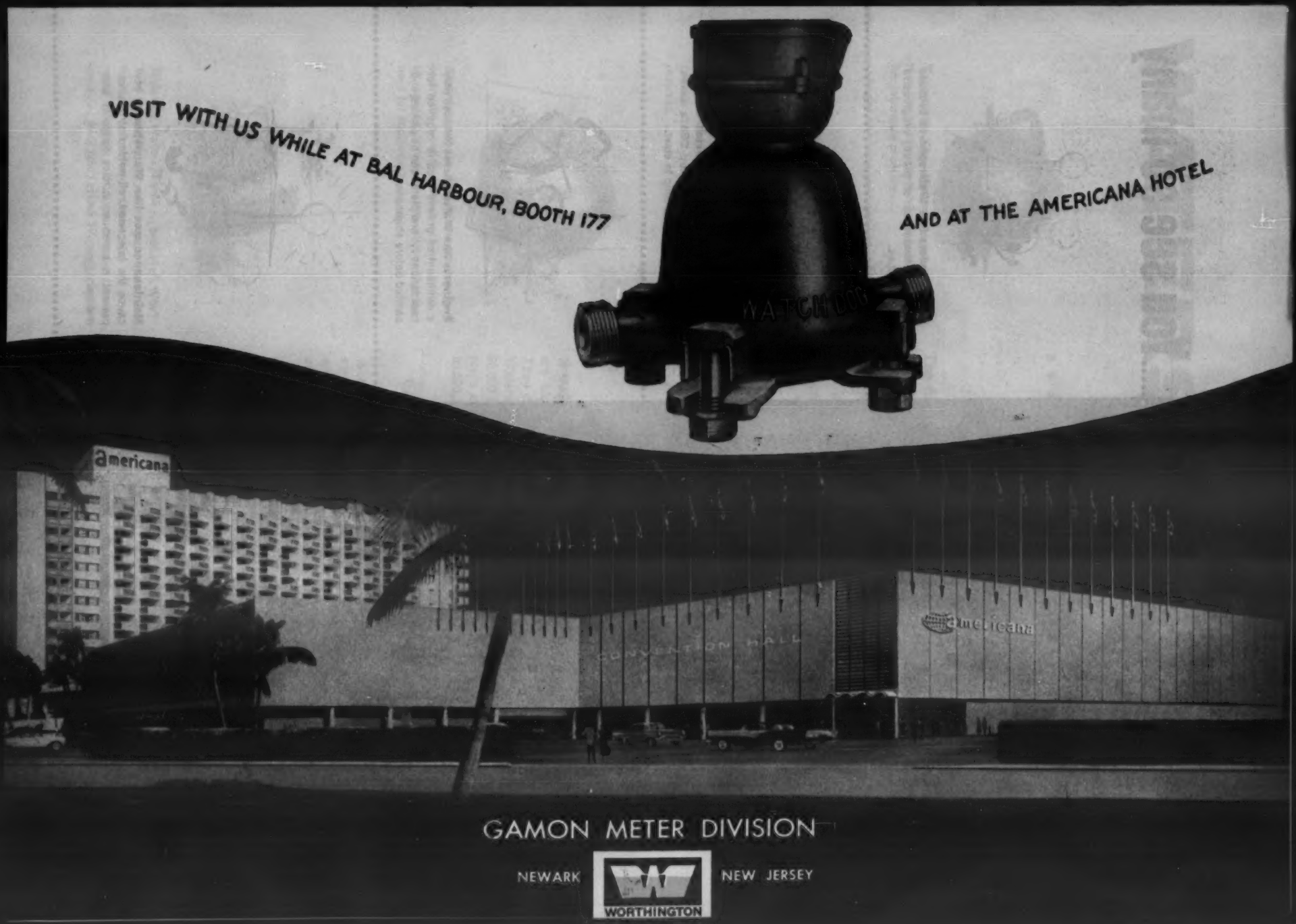

VISIT WITH US WHILE AT BAL HARBOUR, BOOTH 177
AND AT THE AMERICANA HOTEL
americana
CONVENTION HALL
americana
GAMON METER DIVISION
NEWARK
WORTHINGTON
NEW JERSEY

....You see so many

Civic leaders like Waterspheres because they are landmarks of proud, progressive communities.

City fathers like Waterspheres because each structure is backed by CB&I's seven decades of craftsmanship in steel.

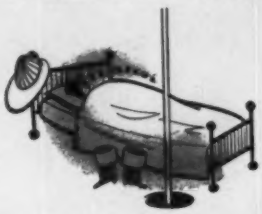
Engineers like Waterspheres because only a minimum of ground area is required for foundations . . . and plates can be pickled and painted before shipment.

Maintenance men like Waterspheres because the integrated, all-welded structures present a minimum surface to paint and maintain.

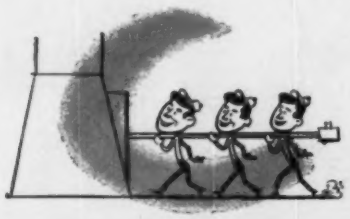
M6450B

WATERSPHERES®

Taxpayers like Waterspheres because they are often responsible for reductions in fire insurance premiums.



Firemen like Waterspheres because they provide round-the-clock emergency water reserves.



Superintendents like Waterspheres because the functional bases can be used for storage or pumping, often eliminating the need for additional buildings.

Kids like Waterspheres . . . best of all. Why? Who knows? But did you ever pass one on the highway without a comment from the back seat? (*Parents like them because they're safe . . . kids can't climb Waterspheres.*)

. . . because they satisfy so many people

The final selection of water storage facilities is often the responsibility of a small group. Vast numbers of the population are affected, however. And . . . if this choice is not suitable to the majority of citizens, loud protests are certain to be heard.

This is why more and more communities rely on CB&I Waterspheres (and Waterspheroids *) to solve their water storage problems. You just can't miss them. They landmark municipal progress . . . combining beauty and prestige with efficient water system planning. Yes . . . you see so many Waterspheres . . . because they satisfy so many people.

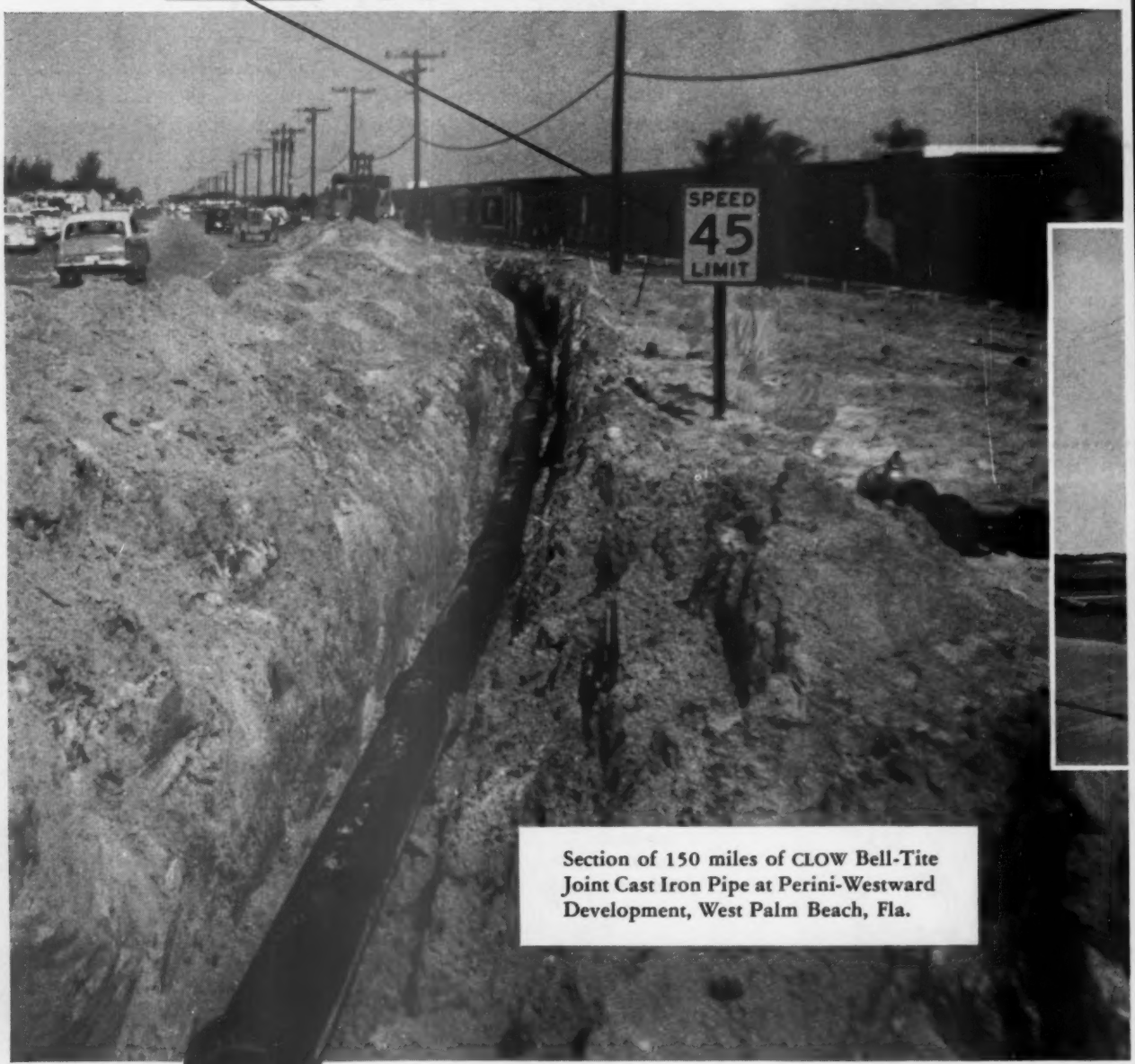
***WATERSPHEROIDS . .** are big brothers to Waterspheres. They differ only in shape and size. Watersphere capacities range from 25,000 to 250,000 gallons. Waterspheroids are available in capacities up to 500,000 gallons.

A brochure containing details and specifications on both the Waterspheres and Waterspheroid is available. Ask for Catalog A-40.

CHICAGO BRIDGE & IRON COMPANY
CBI
332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS
OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

CLOW

This SIGN applies to the highway



Section of 150 miles of CLOW Bell-Tite Joint Cast Iron Pipe at Perini-Westward Development, West Palm Beach, Fla.

Clow Cast Iron Pipe Plants are located at
BENSENVILLE, ILLINOIS • BIRMINGHAM, ALABAMA • COSHOCTON, OHIO

CAST IRON

PIPE

There is no limit to how fast you can lay

CLOW Bell-Tite® JOINT CAST IRON PIPE

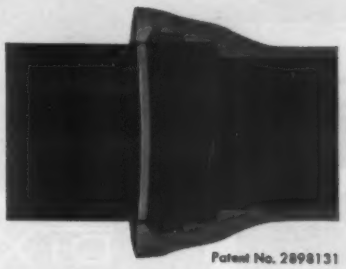
You can install CLOW Bell-Tite Joint Cast Iron Pipe as fast as you can dig a shallow trench. Photo shows the back hoe which clawed open the trench lowering a length of Clow pipe into it.

Over 150 miles of Clow Bell-Tite Joint pipe are the life lines of the water and sewage facilities for this Perini-Westward Development at West Palm Beach, Fla. Time-saving installation plus the economy of material—no accessory but a single molded rubber gasket—are important factors in this $4,000,000 waterworks project installation. One of the owners of this "City within a City" is Louis R. Perini, chairman of the board of the Milwaukee Braves and president of the Perini corporation.

CLOW Bell-Tite Joint Cast Iron Pipe can speed your installations, too. Let us tell you about its many advantages.

Clow Bell-Tite Joint Pipe saves time and money

Assembly is easy and rapid. Just wipe the joint clean, lubricate and push spigot into the bell. When yellow stripe is no longer visible, joint is bottle tight. A single rubber gasket is the only accessory. There are no bolts, no nuts, no followers, no couplings, no extras.



Patent No. 2898131

CLOW CAST IRON PIPE

JAMES B. CLOW & SONS, INC.
201-299 North Talman Avenue, Chicago 80, Illinois

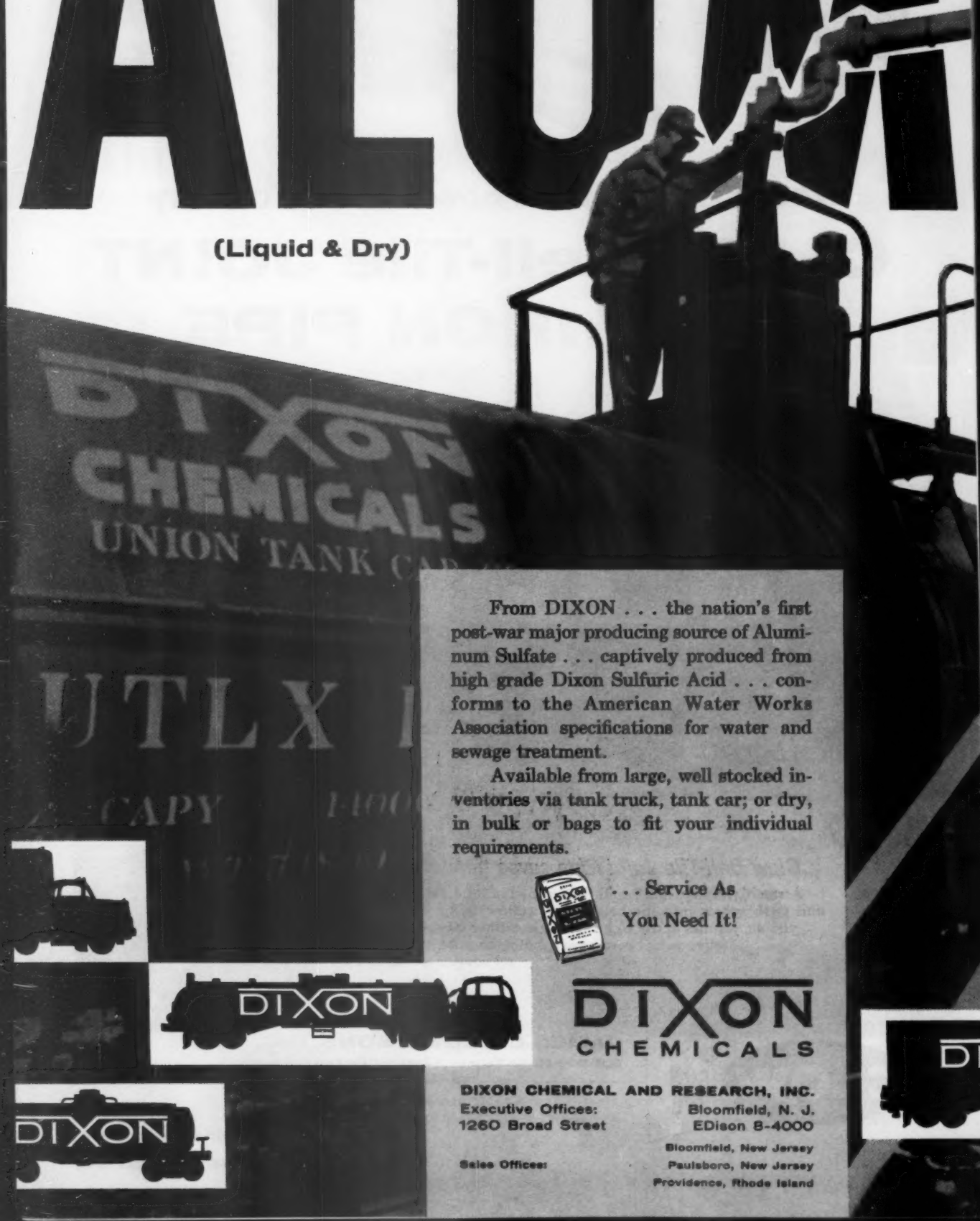
Subsidiaries:

Eddy Valve Company
Waterford, N.Y.

Iowa Valve Company
Oskaloosa, Iowa

ALUM

(Liquid & Dry)



From DIXON . . . the nation's first post-war major producing source of Aluminum Sulfate . . . captively produced from high grade Dixon Sulfuric Acid . . . conforms to the American Water Works Association specifications for water and sewage treatment.

Available from large, well stocked inventories via tank truck, tank car; or dry, in bulk or bags to fit your individual requirements.

. . . Service As You Need It!

DIXON
CHEMICALS

DIXON CHEMICAL AND RESEARCH, INC.

Executive Offices: 1260 Broad Street — Bloomfield, N. J. EDison 8-4000

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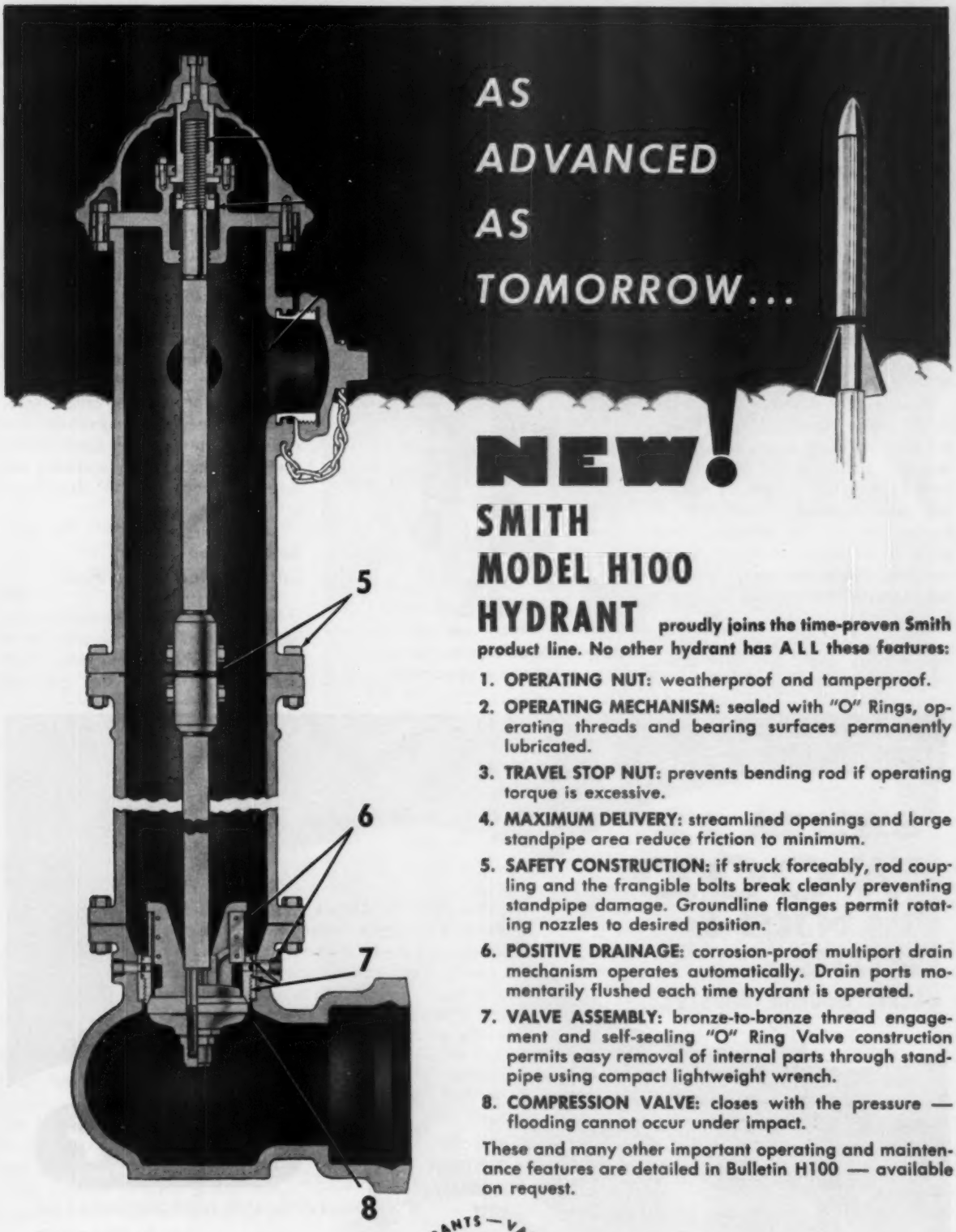


NEW!

SMITH MODEL H100 HYDRANT

proudly joins the time-proven Smith product line. No other hydrant has ALL these features:

1. **OPERATING NUT:** weatherproof and tamperproof.
2. **OPERATING MECHANISM:** sealed with "O" Rings, operating threads and bearing surfaces permanently lubricated.
3. **TRAVEL STOP NUT:** prevents bending rod if operating torque is excessive.
4. **MAXIMUM DELIVERY:** streamlined openings and large standpipe area reduce friction to minimum.
5. **SAFETY CONSTRUCTION:** if struck forceably, rod coupling and the frangible bolts break cleanly preventing standpipe damage. Groundline flanges permit rotating nozzles to desired position.
6. **POSITIVE DRAINAGE:** corrosion-proof multiport drain mechanism operates automatically. Drain ports momentarily flushed each time hydrant is operated.
7. **VALVE ASSEMBLY:** bronze-to-bronze thread engagement and self-sealing "O" Ring Valve construction permits easy removal of internal parts through standpipe using compact lightweight wrench.
8. **COMPRESSION VALVE:** closes with the pressure — flooding cannot occur under impact.

These and many other important operating and maintenance features are detailed in Bulletin H100 — available on request.

HYDRANTS — VALVES

THE A.P. SMITH MFG CO.

SINCE 1896

EAST ORANGE NEW JERSEY

Equipment News

CONTINUED FROM PAGE 28A

New Motor for Jet Well Pump

510

A. O. Smith Corporation, Tipp City, Ohio, have developed a fractional horsepower, jet pump motor that has a sealed cavity in its drive end casting which permits the pump impeller to be coupled directly to its shaft. The design thus eliminates the usual adapter casting and pump stub shaft.

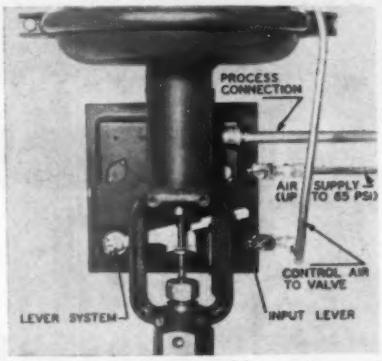
Among other features of the pump is the sealed capsule design. This is a totally enclosed, removable canopy housing that guards the starting switch, actuator, capacitor, thermostat and terminal board from all foreign matter. By grouping these parts in the opposite-shaft-end canopy, the design also serves to eliminate external protrusions to streamline the motor.

The Smith company builds this design into its single and three phase, jet pump motors ranging from ⅓ to 3 horsepower, and into all of its general purpose, single phase motors.

Indicating Controller and Valve Positioner

511

U. S. Gauge Div., American Machine and Metals, Inc., Sellersville, Pa., has developed a new two-in-one



instrument that combines, in one valve-mounted unit, the functions of: (1) an indicating pneumatic controller for temperature or pressure, and (2) a "valve positioner", which amplified air power to provide accurate and rapid positioning of a pneumatic-operated control valve.

Pneumatic controllers with separate valve-mounted positioners have been available for some years. Uniqueness of the Pilot-Positioner is its combination of the two into one compact, relatively low-cost package. By being located close to the process and to the valve it controls, the Pilot-Positioner minimizes transmission lags and provides a high order of precision and speed in valve positioning. It can be mounted by the valve manufacturer on most makes of diaphragm motor valve, or certain other types of pneumatic operators, and requires only one air supply. This saves appreciably on installation and maintenance costs.

Sewer Pipe Has Compression Type Seal

512

Natco Corporation, Pittsburgh, Pa., has announced the availability of its clay sewer pipe incorporating Vitri-Seal joints, a compression type seal

SANTA FE
WOOD
TANKS &
PIPE . . .
SERVE MODERN INDUSTRY...

SANTA FE WOOD TANKS & PIPE are found as standard equipment in many modern industrial installations. Over 50 years of experience in developing and manufacturing precision wood products enables Santa Fe to supply the correct type of equipment for your needs. Wood Tanks & Pipe are an economical and efficient answer to many liquid storing, handling and processing problems.

MINIMIZE CORROSION . . . ELIMINATE RUST

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PRODUCTS COMPANY
a division of The FLUOR CORPORATION, Ltd.
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SANTA ROSA, CALIFORNIA
Representatives in principal cities
FP-128

SERVING INDUSTRY WITH WOOD PRODUCTS FOR:
WATER & SEWAGE TREATMENT • IRRIGATION • PETROLEUM PROCESSING • WATER STORAGE • FOOD PROCESSING • MINING & MILLING • HYDROELECTRIC POWER • CHEMICAL PROCESSING
WRITE, CALL OR WIRE FOR:
SANTA FE WOOD TANK BULLETIN B-145 and WOOD PIPE BULLETINS P-56 and WP-100

Equipment News

that is self-aligning, leak-proof, resilient, acid and alkali resistant, and root-proof.

This new joint consists of polyester fixed rings placed in the bell and on the spigot ends, and an especially designed flexible rubber "O" ring which acts as the seal. This seal remains tight all around the socket under high shear loading stresses.

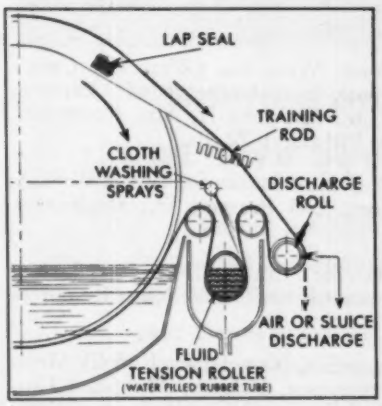
The Vitri-Seal joint conforms to all requirements of ASTM Specification C13 for standard strength clay pipe or to Specification C200 for extra strength, and to Type III of Specification C 425-58T for pipe joints having resilient properties.

New Cloth Discharge Filter

513

Peterson Filters and Engineering Co., Salt Lake City, Utah, has developed a device that will continuously remove a fabric medium from a drum filter, wash it thoroughly, and then automatically replace it on the drum.

According to the company, internal cloth blinding is prevented, cakes too thin for other filters can be completely discharged without blow back al-



lowing for fast drum cycles to reach ultimate capacity, and cloth life is extended because there is no scraper abrasion or cutting action from particles held in the threads of the cloth.

The problem of rapid lateral creep in the cloth has been eliminated by replacing the rigid tension roller with water. This "Fluid Tension" quickly compensates for variation in cloth stretch. With uniform tension, there is only nominal lateral creep. In fact, periodically changing the angle of a simple training rod during the early stages of a new cloth is the only adjustment required.

Ductile Iron Control Valves

514

Conoflow Corporation, Philadelphia, Pa., now is supplying Series LB control valves and Series IM handwheel valves with Dutile Iron bodies.

Ductile Iron is a new cast metal which has the corrosion resistance of gray cast iron and ductility and strength approaching that of carbon steel. Ductile iron is lower in cost than steel or bronze and is a suitable replacement for both on many services where cast iron is not satisfactory. It has a higher temperature-pressure rating than cast iron or bronze, and affords greater safety and is more rugged than cast iron due to its higher strength and ductility.

Conoflow Series LB and LM Ductile Iron valves are available in the straight-through design in sizes ¾" through 6", with 150-300# ASA

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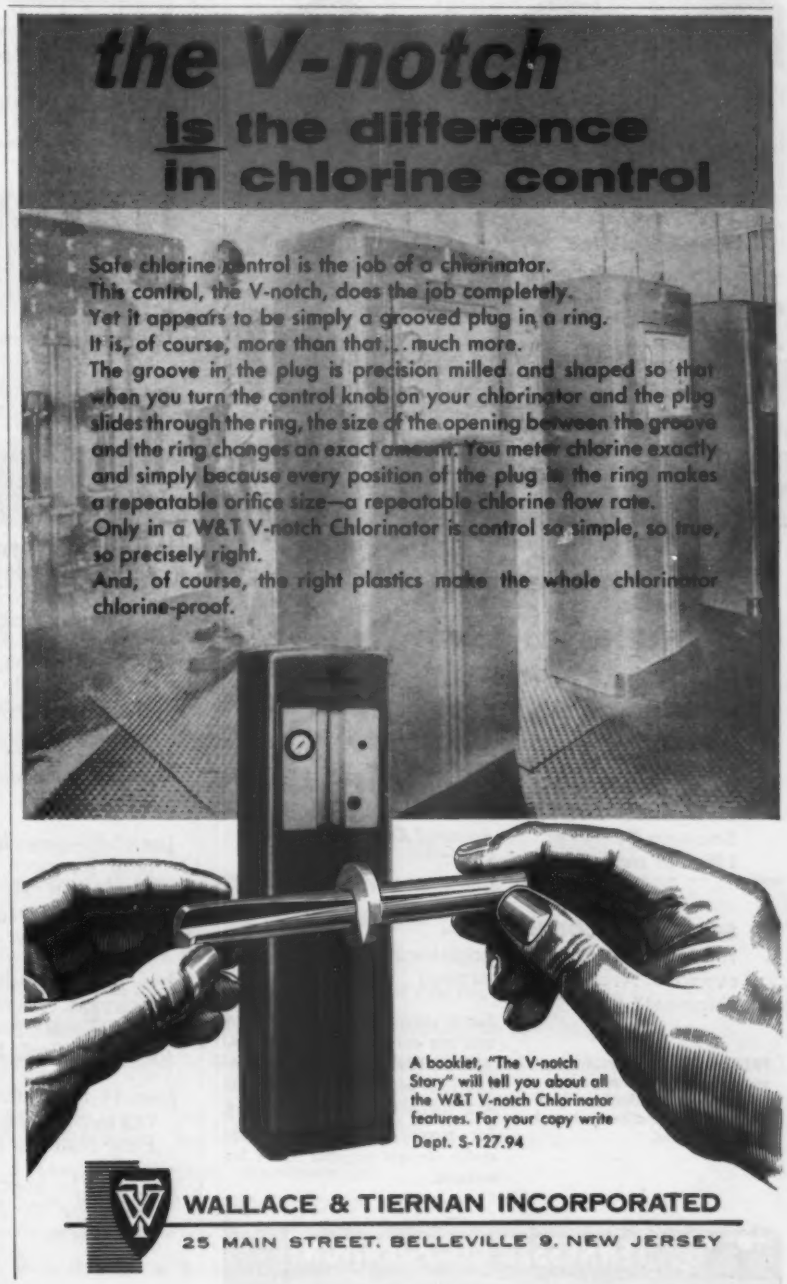
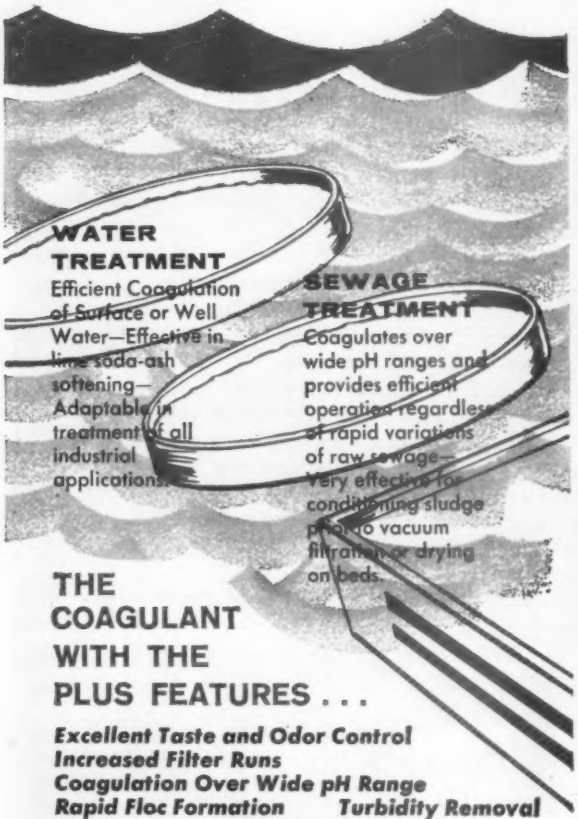

the V-notch
is the difference
in chlorine control
Safe chlorine control is the job of a chlorinator.
This control, the V-notch, does the job completely.
Yet it appears to be simply a grooved plug in a ring.
It is, of course, more than that... much more.
The groove in the plug is precision milled and shaped so that when you turn the control knob on your chlorinator and the plug slides through the ring, the size of the opening between the groove and the ring changes an exact amount. You meter chlorine exactly and simply because every position of the plug in the ring makes a repeatable orifice size—a repeatable chlorine flow rate.
Only in a W&T V-notch Chlorinator is control so simple, so true, so precisely right.
And, of course, the right plastics make the whole chlorinator chlorine-proof.
A booklet, "The V-notch Story" will tell you about all the W&T V-notch Chlorinator features. For your copy write Dept. S-127.94
WALLACE & TIERNAN INCORPORATED
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

ELIMINATE YOUR WATER TREATMENT PROBLEMS WITH...

ferri-floc

FERRIC SULFATE


WATER TREATMENT
Efficient Coagulation of Surface or Well Water—Effective in lime-soda-ash softening—Adaptable in treatment of all industrial applications.
SEWAGE TREATMENT
Coagulates over wide pH ranges and provides efficient operation regardless of rapid variations of raw sewage—Very effective for conditioning sludge prior to vacuum filtration or drying on beds.

THE COAGULANT WITH THE PLUS FEATURES . . .

Excellent Taste and Odor Control
Increased Filter Runs
Coagulation Over Wide pH Range
Rapid Floc Formation ***Turbidity Removal***
Manganese and Silical Removal
Bacteria Removal ***Ease of Operation***
Efficient and Economical

SODIUM SILICOFLUORIDE— for Fluoridation of municipal water supplies. Available for prompt shipment.

FREE BOOKLET Let us send you without charge, a 38-page booklet that deals specifically with all phases of coagulation—just send us a postal card.

For a complete list of our products see our inserts in CHEMICAL WEEK BUYER'S GUIDE, Pages 173-176 or CHEMICAL MATERIALS CATALOG, Pages 551-554.

For more detailed information make request on your firm's letterhead.

TENNESSEE CORPORATION
612-629 GRANT BUILDING, ATLANTA 3, GEORGIA

Meetings

1960

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May 15-20—Miami Beach, Fla. (*Bal Harbour Hotel*). A.W.W.A. CONVENTION

May 23-25—Traverse City, Michigan (*Park Place Hotel*) MICHIGAN SEWAGE & INDUSTRIAL WASTES ASSN. Secy., Donald M. Pierce

Jun. 1-3—Morgantown, West Va. (*West Va. Univ.*) Fifth Annual Appalachian Underground Corrosion Short Course. Write: Mr. John H. Alm, Room 605, 2 Gateway Center, Pittsburgh 22, Pa.

Jun. 2—Riverton, N. J. NEW JERSEY SECTION A.W.W.A. A. F. Pleibel, Secy., 683 Prospect St., Maplewood, New Jersey

Jun. 5-8—Honey Harbor, Ontario Seventh Industrial Waste Confer. Sponsored by Ontario Water Resources Commission

Jun. 6-8—New Brunswick, New Jersey Rudolfs Memorial Research Conference, Rutgers, The State University. Dr. H. Heukelekian, Chairman, Dept. of Sanitation, Rutgers, The State University, New Brunswick, New Jersey

Jun. 15-17—Madison, Wis. (*Lorraine Hotel*) CENTRAL STATES SEWAGE & INDUST. WASTES ASSN., Secy-Treas: Scott A. Linsley P. O. Box 3598, Childs Rd., St. Paul, Minn.

June 14-17—Pittsburgh, Pa. (*Hilton Hotel*) PENNSYLVANIA SECTION, A.W.W.A., Secy: L. S. Morgan, 413 First National Bank Bldg., Greensburg.

Jun. 19-22—Mexico City, Mexico (*Del Prado Hotel*) MEETING OF AMERICAN INSTITUTE OF CHEMICAL ENGINEERS

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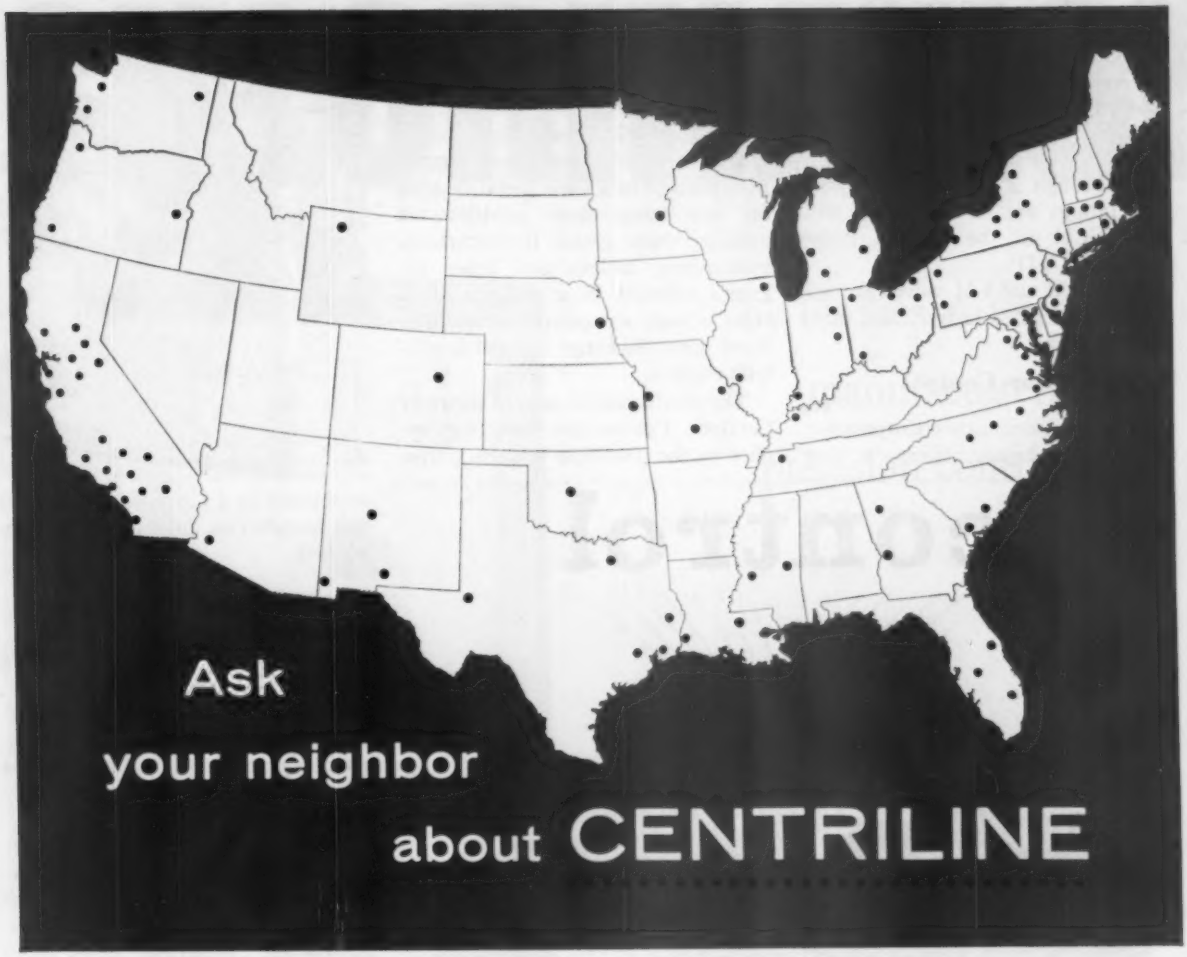


Spotted on this map are some of the places that have been served by the Centriline Process

Chances are that one of your colleagues has rejuvenated some of his city's piping by Centriline reconditioning. Here's your chance to find out.

Briefly, this process smoothly lines piping—*in place*—with cement-mortar, creating a pipe-within-a-pipe. This vastly increases carrying capacity, stops leakage, prevents corrosion and tuberculation, and prolongs pipe life indefinitely. Pressure goes up, pumping cost goes down, and there's no need to disturb traffic to replace mains. Over 6,000,000 feet of piping, from 4" to 144" diameter, have been treated by Centriline. *Ask your neighbor.*

Write today for a list of nearby officials whose cities have cut inconvenience and costs with this pipe-saving process. Hear what they have to say about Centriline. Then write or call us. We'll be glad to show you how Centriline can help *you* solve the problems of pipe conditioning.

BOOTH 153-154
A.W.W.A.
CONVENTION

CENTRILINE CORPORATION

A Subsidiary of Raymond International Inc.

140 CEDAR STREET • NEW YORK 6, N. Y.

Branch offices in principal cities of the United States, Canada, and Latin America.

Equipment News

CONTINUED FROM PAGE 37A

raised face integral flanges. All meet ISA Face-to-Face Dimensions. Also available with screwed connections in sizes through 2". Pressure-temperature ratings are in accordance with Part UCN of the ASME Boiler Code, Sec. VIII.

Series LB and LM valves are still available in steel, bronze, and other castable alloys.

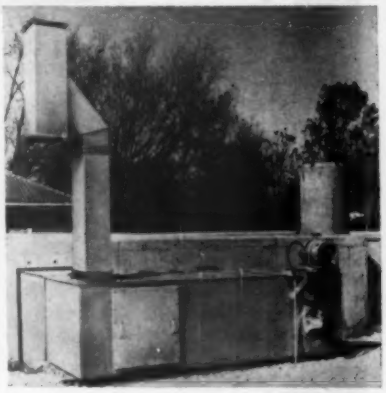
Sewage Odor Control

515

Catalytic Combustion Corporation, Detroit, Michigan, offers a new approach to sewage odor control.

The Catalytic Combustion Process utilizes a metallic supported catalyst incorporated in a sheet metal housing for low temperature oxidation of noxious waste gases. Hydrocarbons, mercaptans, amines and other organics released in a gaseous phase from sewage storage points are oxidized upon discharge through a catalytic element.

The destruction of sewage odors by Catalytic Combustion was first applied to the municipal sewage system at the City of Austin, Texas. Here, obnoxious odors from a million gallon covered sewage holding tank were



deodorized by a Catalytic Combustion unit installed on the roof of the holding tank.

control

for algae and aquatic weeds

In small amounts, Triangle Brand Copper Sulfate controls algae growth and kills some of the more troublesome aquatic weeds. They disintegrate where they are, which prevents downstream infestation or clogged waterways.

In sewage pipes, Triangle Brand Copper Sulfate can be used in such low concentrations to control root and fungus growth that surface trees remain unaffected.

Two informational booklets, "The Use of Copper Sulfate in the Control of Microscopic Organisms," and "Copper Sulfate for Root and Fungus Control in Sanitary Sewers and Storm Drains," available on request.

Phelps Dodge Refining Corp.
300 PARK AVENUE, NEW YORK 22, N. Y.

Transistorized Pipe-Finder Leak-Detector

516

Fisher Research Laboratory, Inc., Palo Alto, California, have announced the development of a combination pipe finder and leak detector that features completely transistorized circuits.

Called the Master, this dual purpose instrument has independent circuits for each operation. Many new materials, such as printed circuits, unbreakable fibreglass cases, and single turn solid aluminum detecting loops have been used to produce greater accuracy and depth penetration under rugged field conditions.

The use of transistors not only makes the instrument sturdier but extends its average battery life to more than 1500 hours of continuous operation. This is equivalent to more than a year of normal field use. The weight of the unit is only twelve pounds.

New Drive Head For Clarifiers

517

Graver Water Conditioning Co., New York, N. Y. has developed a horizontal spur-gear drive for heavy-duty applications of the Rota-Rake clarifier and thickener. It has been designated Model C and joins three other drives available with the Rota-Rake. The Graver Rota-Rake is a horizontal flow water and liquid treatment unit for gravity sedimentation and sludge thickening.

CONTINUED ON PAGE 43A

CHLORINATION

3400 Series Chlorinator

by Fischer & Porter Co.
manufacturers of
precision controls

1960 ushers in the decade of scientific chlorination control. Fischer & Porter has expanded its famed diaphragm principle . . . proved in thousands of installations and adopted as standard throughout the world. The new 3400 series offers you many advanced design features including a *single stack* chlorine gas regulator providing life-long dependability, complete operational safety, and adaptability to any type of automatic control.

Copyright 1960: Fischer & Porter Printed in U.S.A.

First with a Single Stack Regulator

- Ruggedly constructed of heavy, durable, corrosion-resistant parts, the unique single stack regulator packs dozens of new features into the least possible space.
- The exclusive isolating diaphragm prevents even *traces* of moisture from feeding back from the water ejector into the precision functioning parts of the chlorinator.
- The rugged construction of the unitized stack minimizes service and repair. Frail piping between components is eliminated. Parts within the stack are neither sealed nor inaccessible. The stack regulator provides high accuracy and reproducibility even under the widely varying chlorine gas and water supply pressures.

First in Safety and Serviceability

- Controlled vacuum conditions throughout protect plant personnel. Any interruption of ejector vacuum instantly closes the chlorine gas inlet valve and, if desired, actuates alarm signals.
- Inert materials of construction have been carefully selected to assure long life and safety.
- Operating parts are housed within an attractive two-tone fiberglass cabinet. The color is an integral part of the cabinet completely eliminating painting or other maintenance.

First in Flexibility

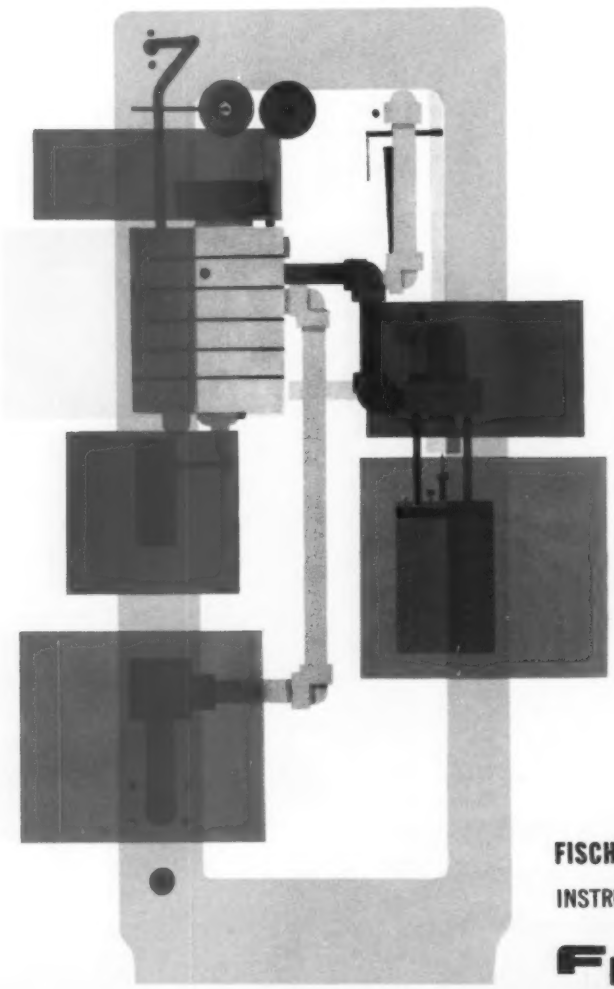
- Both floor and wall-mounted models are available to meet every operating or installation requirement. Each chlorinator is equipped with a precisely calibrated F&P 20:1 range flowmeter. Capacities range from 0.1 to 2000 pounds per day of chlorine gas. Integral or remote ejectors may be selected. Manual-automatic conversion is readily accomplished at your plant.

First in Control—
the Controlomatic Chlorinator

- Controlomatic models of the new line accept electric, pneumatic, or vacuum signals from any type of metering device, and accurately feed chlorine according to proportional, start-stop, program, multiple rate, or residual control requirements. Fischer & Porter can supply the complete system . . . including metering instruments and analyzers as well as the chlorinator. The unique Vis-I-Flow proportioning valve is safety-enclosed and yet visible! You can check performance and accuracy at all times.

GET COMPLETE FACTS! Contact your local Fischer & Porter Representative now, or, write for your copy of free Catalog 70C3400. Fischer & Porter Co., Department 12, Warminster, Pennsylvania.

Single Stack Regulator | Dosage Controller | Vis-I-Flow Valve | Automatic Proportioning Control | Chlorine Input & Heater | Ejector



FISCHER & PORTER COMPANY

INSTRUMENTATION AND CHLORINATION

FP

Equipment News

CONTINUED FROM PAGE 40A

The new drive head is a ruggedly constructed, heavy-duty unit with a completely enclosed, integral gearing arrangement. The gears, operating in an oil bath, are of Mechanite cast iron as is the housing. Anti-friction ball and roller tapered bearings are used throughout. The pinions are of forged steel. The Model C drive features smooth-running, quiet operation with little wear and minimum maintenance consisting of an infrequent oil change and regreasing about once every five years. The other drives are the Models D (direct-coupled), E (speed-reducer chain and sprocket), and W (worm-gear).

Electronic Indicator

518

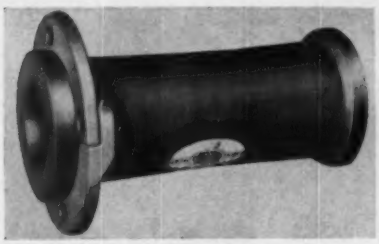
The Hays Corporation, Michigan City, Indiana has announced a distinctive, clearly visible electronic Indicator whose use, with accessories, is to indicate values of flow, liquid level, temperature, pressure, position, input motion, % O_2, % CO_2, % H_2, pH, resistance and dc millivolts.

Styled as Model 721 Electronic Indicator, either one of two electronic receiver units can be incorporated for operation with suitable transmitters—a differential transformer receiver, or a slidewire receiver. Both units have a full complement of accessories which can be mounted on each, including switches and slidewires.

Flexible Pipe With Screwed Coupling

519

General Rubber Corporation, Tenafly, N. J., is manufacturing a com-



plete line of Screwed Coupling, Flexible Pipe, Type "S", which is available in all sizes from ¾" to 3" diameter and in standard lengths from 18" to 36". Longer lengths are also available.

These Screwed Coupling Flexible Pipes are furnished with standard iron pipe threaded ends, either Male-Male, Male-Female or Female-Female. Special couplings can also be furnished.

The tough Type "S" line incorporates a single piece, leak-proof, oil resistant tube with the brass couplings expanded to the full inside diameter of the pipe. All sizes are rated at 250 p.s.i.g. maximum working pressure, with a minimum four-to-one safety factor. The standard Type "S" pipe is rated for a maximum temperature rating of 180°F. Special tube compounds are available for higher working temperatures.

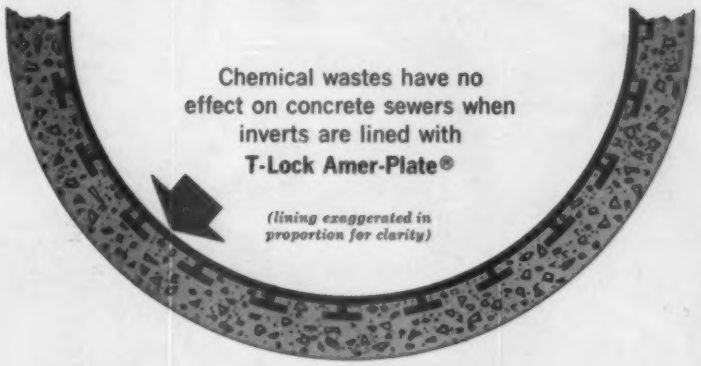
Semi-Steel Plug Valves

520

W-K-M div., ACF Industries, Inc., Houston, Texas, has introduced a new line of sime-steel plug valves, which uses a quarter section eccentric plug. The new valve requires no lubrication, is available in 150 WOG

CONTINUED ON PAGE 102A

How to Protect Concrete Sewers from Chemical Wastes


Chemical wastes have no effect on concrete sewers when inverts are lined with
T-Lock Amer-Plate®
(lining exaggerated in proportion for clarity)

T-Lock Amer-Plate is a high polymer PVC sheet, easily cast into pipes, tunnels and structures to form a partial or complete 360° protective lining. Used in inverts, it permanently protects concrete from corrosive chemical effluents. In arch areas, it positively stops oxidized H_2S corrosion. T-Lock is also highly abrasion resistant; impartial tests show that it abrades at only 1/70th the rate of concrete.

The fact that T-Lock ends erosion and corrosion problems in industrial and municipal sewer systems is attested to by more than five million square feet now in use. Write for complete data on this maintenance-saving lining before designing your next sewer.

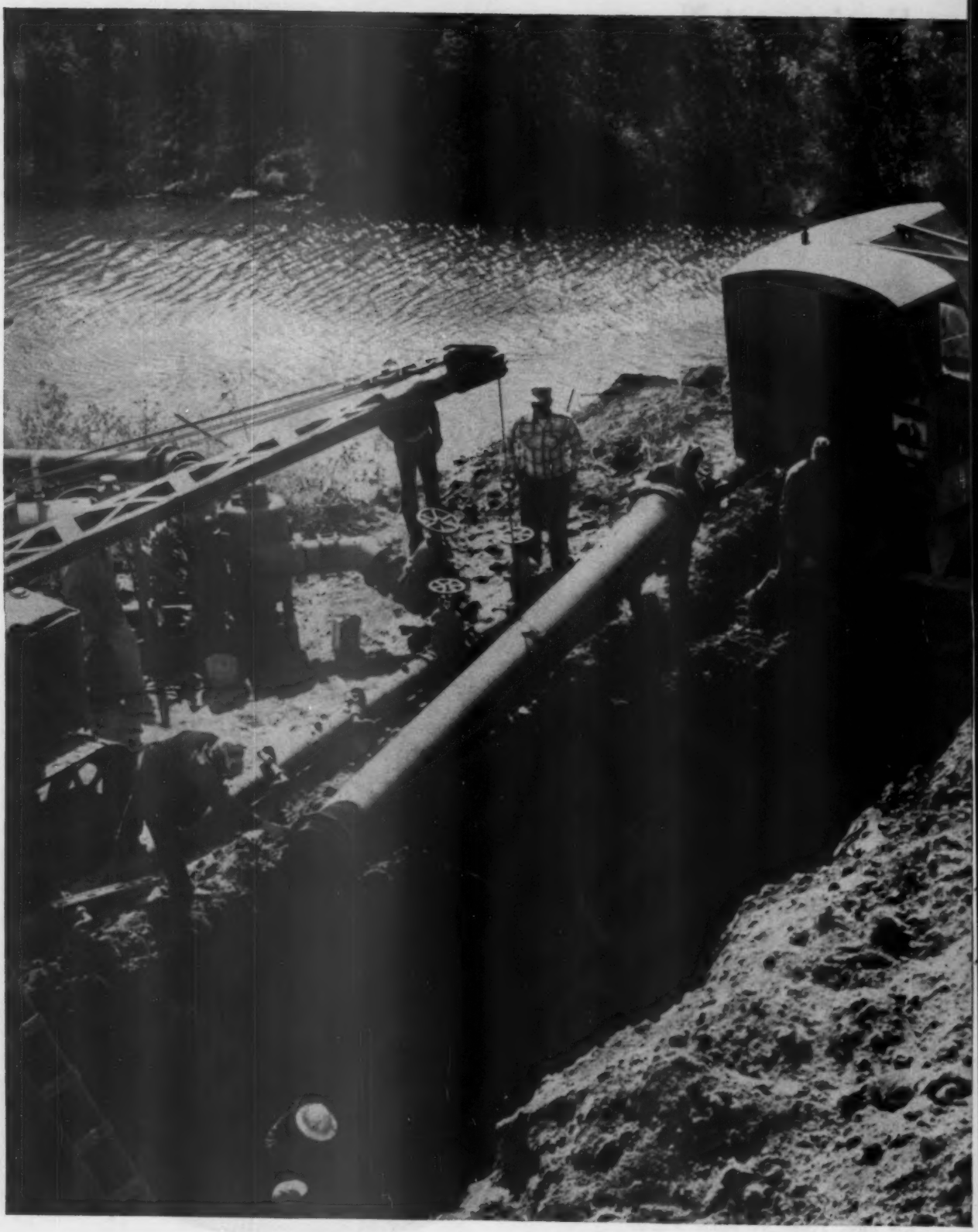
Applicators strategically located throughout U. S. and Canada

Amercoat® CORPORATION

Dept. WE • 4809 Firestone Boulevard • South Gate, California

921 Pitner Ave. Evanston, Ill. | 360 Carnegie Ave. Kenilworth, N.J. | 2404 Dennis St. Jacksonville, Fla. | 6530 Supply Row Houston, Texas

118



WILL PERFORM FOR A CENTURY WITH A RIVER ON ITS BACK

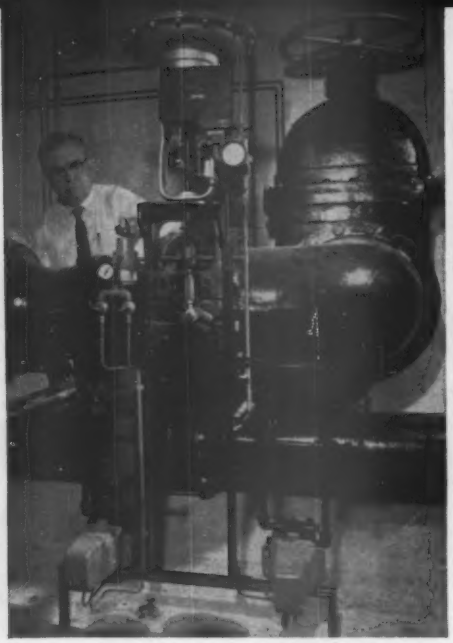
At left, you see a length of cast iron pipe being installed under the Floyd River in Iowa. This is part of a water feeder main which will reinforce the existing water supply system.

Despite the severe conditions of a river overhead, the inherent ruggedness of cast iron pipe promises at least a century of trouble-free performance, and rarely requires repairs or replacement.

And cast iron pipe's cement lining assures a continued full flow of water year after year. It's no wonder that more than 90% of the pipe used for water supply systems in our 50 largest cities is cast iron pipe!

CAST IRON PIPE RESEARCH ASSOCIATION.
Thos. F. Wolfe, Managing Director.
3440 Prudential Plaza, Chicago 1, Illinois

CAST IRON PIPE
THE MARK OF THE 100-YEAR PIPE



Honeywell built and

TORRESDALE..

Honeywell staff engineer makes final checkout of effluent rate-of-flow controller system. Note use of short form Venturi tube with pneumatically operated, full bodied, rubber seated A.W.W.A. butterfly valve and diaphragm motor operator with positioner.

View of north section filter gallery and control consoles. Plant is designed so that each section can work independently of the other with independent wash water supply and master control panel.

installed system controls . . .

. . $25 MILLION PUSHBUTTON WATER PLANT

Designed to provide normally 282 million gallons of water each day, Philadelphia's new $25 million Torresdale plant has a maximum capacity of 423 mgd. From the time raw Delaware River water enters the plant for pre-treatment until it's pumped into distribution mains from underground storage reservoirs, the purification process is constantly monitored and controlled by an extensive Honeywell system of pneumatic, electric and electronic instrumentation.

The nerve center of each of the 94 rapid sand filters is a stainless steel console housing a programming system that provides—at the operator's option—a fully automatic backwash sequence or manual operation. Other sub-systems provide for the monitoring of chemical levels in storage tanks with preset high and low alarms . . . maintenance of normal reservoir levels depending on the city's demands, by a combination of electronic level and pneumatic flow controllers . . . and a master control panel for each of the two filter galleries.

To take advantage of Honeywell's experience in applying these latest techniques in water plant instrumentation, call your nearby Honeywell field engineer . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Torresdale Water Plant, City of Philadelphia: Samuel S. Baxter, Water Commissioner
Consulting Engineer: Morris Knowles, Inc.—Pittsburgh
General Contractor: Ambrose-Augusterfer Corp.—Philadelphia
Mechanical Contractor: McCloskey and Company—Philadelphia

Each console includes instruments for recording filter operations and pushbutton controls for starting and determining length of backwash programming.

Water Commissioner Baxter and Deputy Commissioner Arnold analyze wash water consumption for north section filter gallery from data recorded on master control panel.

75th YEAR PIONEERING THE FUTURE

Honeywell

H HONEYWELL *First in Control* SINCE 1885

THERE MUST BE A BETTER SYSTEM

To keep up with the baby boom and the flight of urbanites to suburbia, your community must have a bigger and better water system. You can't crowd an expanding population into a water system created for the needs of years gone by.

No need for taxes to get out of hand, though. Your community can put a ceiling on costs of expansion. Yet, still provide the finest in water service. How? By doing as you do in business. By using only modern methods and materials, like "K&M" Asbestos-Cement FLUID-TITE Pressure Pipe.

Tax savings start with the low initial cost of this thrifty pipe. Continue with its fast, economical installation. And, go on year after year with its miserly maintenance costs.

Being non-metallic, "K&M" Asbestos-Cement FLUID-TITE Pressure Pipe is electrolysis-immune. Won't rust or tuberculate. (Tuberculation is the formation in metallic pipe of pipe-clogging, flow-reducing gunk.) The exclusive, patented "K&M" FLUID-TITE Coupling forms a permanently leak-tight seal. Chances are, your community will never have to give "K & M" Asbestos-Cement FLUID-TITE Pressure Pipe a thought, once installed.

You see, "K&M" is no Johnny-come-lately. For eighty-five years, it's been turning out asbestos products for use in industry, commerce, municipalities, and homes.

As a civic-minded citizen you can help your community obtain the finest water service for their tax dollars. "K&M" will be glad to supply you and your local officials with technical data on "K&M" Asbestos-Cement FLUID-TITE Pressure Pipe. Plus technical assistance to you and your consulting engineer. Just write to us today: KEASBEY & MATTISON Company, Ambler • Pennsylvania.

KEASBEY and MATTISON at Ambler

This ad appeared in FORTUNE Magazine to help arouse public support for better water systems.

Relieve the growing pains of your water system with quality...

K&M

ASBESTOS-CEMENT PRESSURE PIPE!

"K&M" Asbestos-Cement FLUID-TITE Pressure Pipe offers a practical solution to a new water system or to the problems of water system expansion.

The growth of population and industry forces the expansion of water service in thousands of communities. But, higher taxes aren't popular. Your taxpayers are bearing already the costs of other community services.

"K&M" Asbestos-Cement FLUID-TITE Pressure Pipe gets you out of this cost-quality squeeze. It's a quality pipe whose low initial cost is often your last cost.

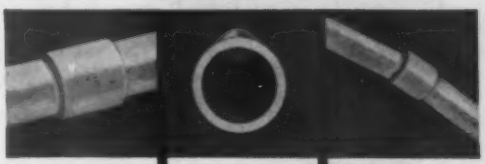
This practically indestructible pipe has all of the durability and stamina of asbestos-cement. Non-metallic, it won't rust, tuberculate, clog, or corrode. It's completely immune to electrolysis. Its bore is permanently smooth and clean. Pumping costs remain low. Each joint is permanently water-tight.

Installation is another area of savings. You can lay more pipe per hour than ever before. The exclusive, patented "K&M" FLUID-TITE Coupling slides on in two easy steps. No heavyweight coupling pullers or heavy machinery required.

Neither weather nor soil conditions can stop work. In planning your water system, you can allow a 5° deflection per pipe length.

Write today for detailed and illustrated information on "K&M" Asbestos-Cement FLUID-TITE Pressure Pipe. Learn why thousands of communities from coast to coast have turned to this thrifty, durable-as-stone pipe. Write to: Keasbey & Mattison Company, Dept. P-950, Ambler, Pennsylvania.

K·M

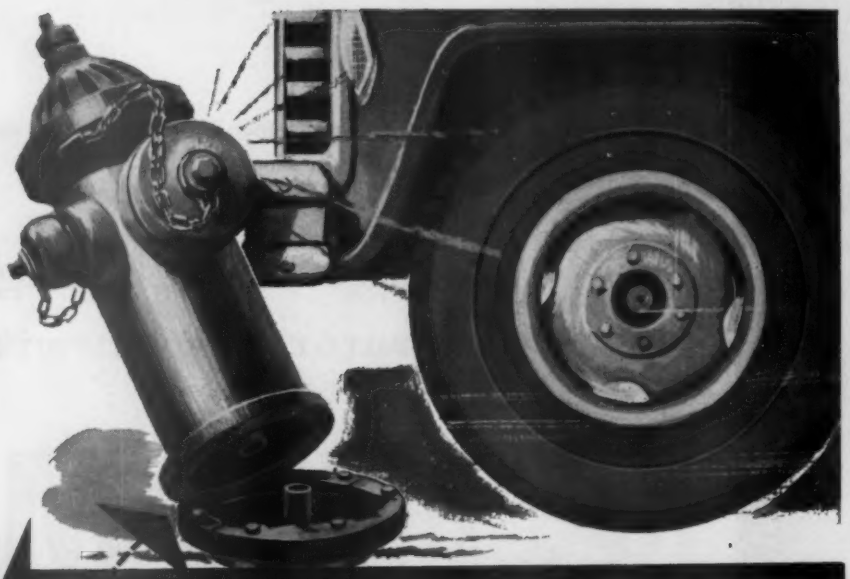


Exclusive, patented "K&M" FLUID-TITE Coupling forms a permanent leak proof seal.

Permanently smooth bore keeps pumping costs low. Flow characteristics excellent.

5° deflection permitted per pipe length. Resilient joints also absorb vibration.

KEASBEY and MATTISON at Ambler



THIS DEMONSTRATION

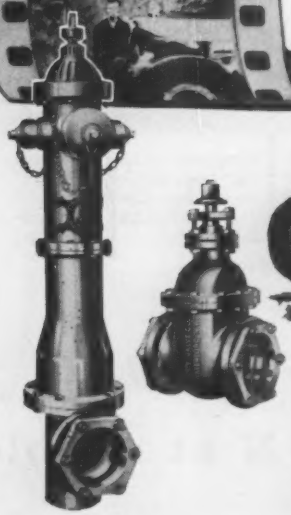
...proved the advantages of

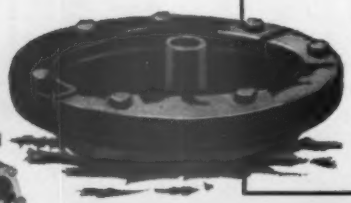
THE NEW EDDY BREAK-FLANGE HYDRANT

• Clean breaking action of the new EDDY break-flange hydrant is clearly demonstrated in this film strip of a test made recently for Mr. Herbert Campbell, Town Engineer, Wayne, New Jersey. Just as it was designed to do, the hydrant broke off at the break-flange and the coupling sheared at the weak point.

Mr. Campbell was so impressed that he changed the specifications on the spot...wrote new specifications around the EDDY Hydrant. Another EDDY feature which appeals to economy-minded waterworks officials is that these hydrants, with the break-flange feature, are the same as standard EDDY models in all other respects. Working parts are interchangeable and no separate inventory of repair parts is required.

We'll be glad to help you arrange a similar demonstration.
It pays to standardize on EDDY hydrants and valves.





NO HARM TO HYDRANT...

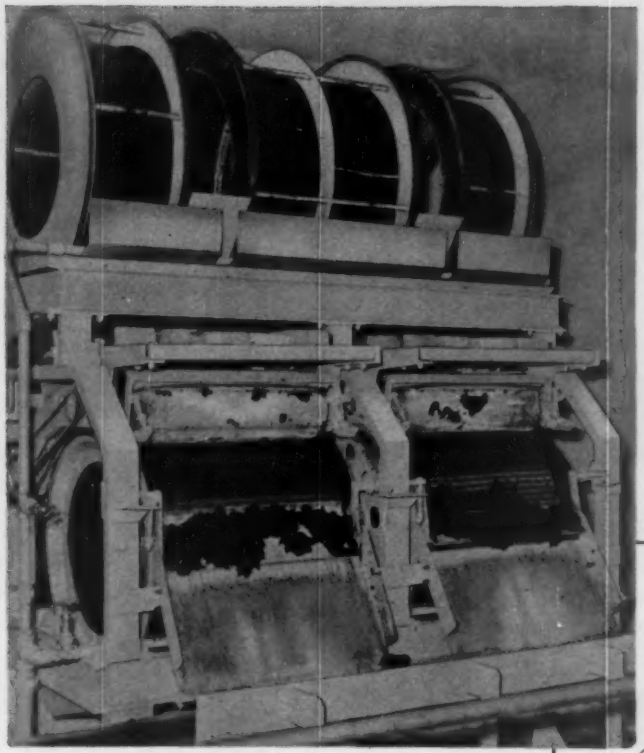
As shown, the safety stem coupling shears off at the ground line. The break-flange gives way without damage to stand pipe or nozzle sections. With break-flange construction the hydrant is easily and economically replaced without digging or costly repairs.

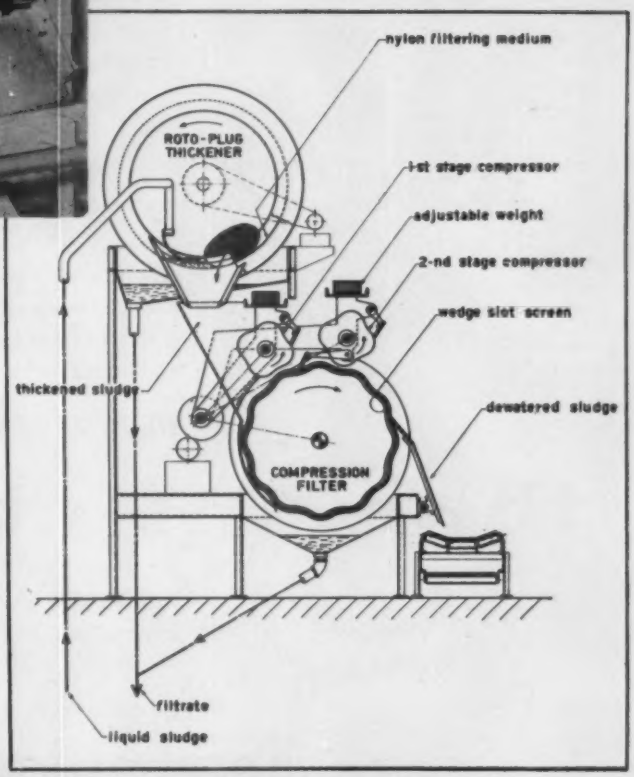
EDDY VALVE COMPANY
A Subsidiary of James B. Clow & Sons, Inc.

WATERFORD NEW YORK

THICKEN & DEWATER SEWAGE & INDUSTRIAL SLUDGE

Without use of Chemicals





To thicken and dewater sewage and industrial sludge without use of chemicals specify the "Roto-Plug" Sludge Concentrator.

Its use saves the cost of chemicals, chemical handling, storage space. No need for those expensive, hazardous, and hard-to-handle chemicals. And the electrical drives on a "Roto-Plug" that produces 1000 lbs per hour of sewage solids total only 1¼ h.p.

For full details of the "Roto-Plug" write for Technical Bulletin RP 100. Also write for 24-page Sludge Furnace Bulletin #238.

NICHOLS ENGINEERING & RESEARCH CORP.

80 Pine Street, New York 5, New York

3513 N. Hovey Street, Indianapolis 18, Ind. • 405 Montgomery Street, San Francisco, Calif.

NON-CLOG SEWAGE AND TRASH PUMPS...
a Fairbanks, Morse first, are matchless in mechanical construction and long-life, low-cost quality! Designed to handle unscreened sewage, storm water, and industrial wastes, our Non-Clog Pumps are the products of 75 years experience in making better pumps for municipalities.

More City Halls

There is a Fairbanks, Morse pump to meet all the needs of any municipality, regardless of size or location. Vertical type pumps ideal for wet or dry pit installation. Horizontal type pumps for direct drive.

call for F-M PUMPS

ANGLE FLOW PUMPS... proved big volume performers because of wide, unobstructed passages through impeller and volute, are ideal for sewage and storm water. Rugged construction insures low-cost operation! Standard sizes (vertical or horizontal) available in horse powers and capacities for every

and MOTORS

requirement. Vertical units designed for dry or wet pit service. Horizontal pumps mounted either on soleplates or steel baseplates can be powered by direct-connected motor.

WE ALSO MANUFACTURE peak efficiency Tur-

than any other kind

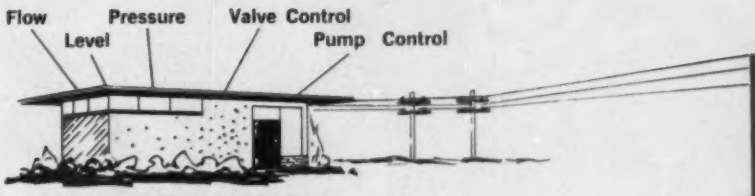
bine Pumps for municipal water systems, single and Multi-Stage Centrifugals for booster stations... and Fire Pumps. For more information, write:

Fairbanks, Morse

PUMP AND HYDRAULIC DIVISION · KANSAS CITY, KANSAS

A MAJOR INDUSTRIAL COMPONENT OF FAIRBANKS WHITNEY CORPORATION, NEW YORK

FLUIDICS* AT WORK



Unattended Pumping Station

Cut costs, improve efficiency— automate your present water system with Simplex Orthoplex Supervisory Control

ORTHOPLEX SYSTEM can pay for itself during the first year of operation.

ORTHOPLEX assumes the responsibility for automatically controlling remote pumping stations, control valves, elevated tanks, reservoirs – FREES PERSONNEL FOR MORE IMPORTANT JOBS.

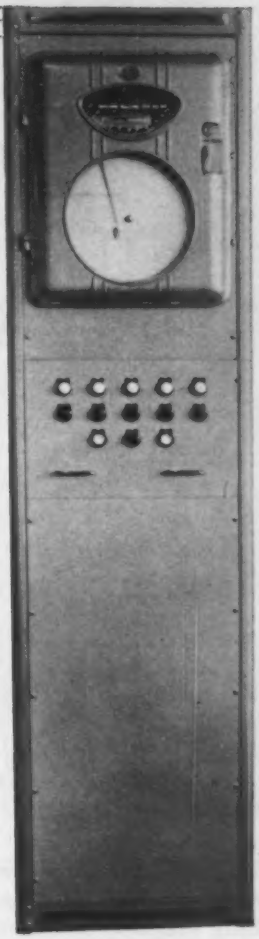
ORTHOPLEX can be installed to operate with most existing flow- and level-sensing devices without change or with the addition of new low-cost devices.

IMPROVED DESIGN reduces maintenance to the minimum by the elimination of all vacuum tubes, motorized timers and motorized sequence switches.

AS MANY AS 29 CHANNELS over a single pair of wires–private or telephone.

FOR COMPLETE INFORMATION, send us your requirements.

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

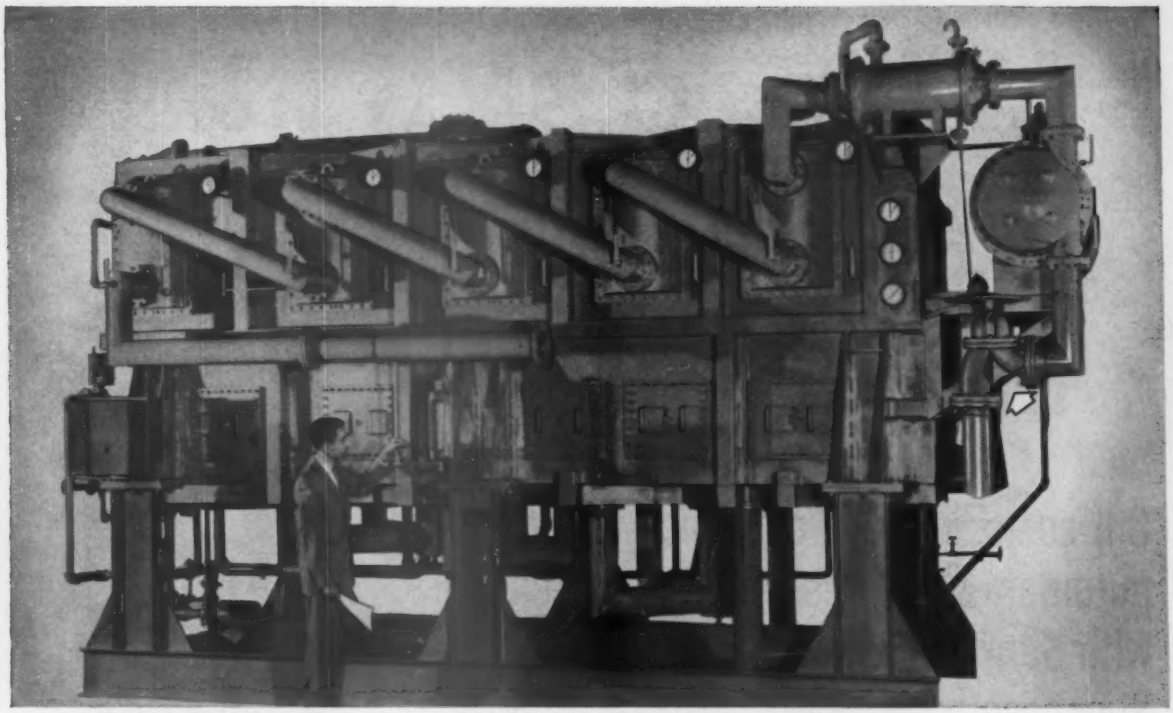


Central Control Station

SIMPLEX
VALVE AND METER COMPANY
a division of PFAUDLER PERMUTIT INC.
Lancaster, Pennsylvania

Specialists in FLUIDICS... the science of fluid processes

SEE THE SIMPLEX ORTHOPLEX IN ACTION AT OUR BOOTH AT THE A. W. W. A. NATIONAL CONVENTION AT BAL HARBOUR, FLORIDA, MAY 15—20, 1960



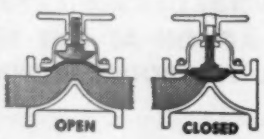
ON LAND At Salinas, a tourist center in Ecuador, this Cleaver-Brooks Flash Evaporator delivers 50,000 gallons of pure, distilled water every 24 hours. It is equipped with two 6", rubber lined, weir-type Grinnell-Saunders Diaphragm Valves — only one of which can be seen from this view.

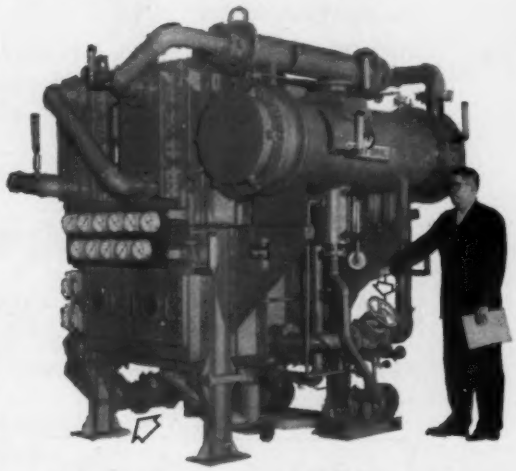
Grinnell-Saunders Diaphragm Valves help convert salt water to fresh water

You can convert sea water to fresh water, in abundant supply, on land . . . or on shipboard, with flash evaporators made by Cleaver-Brooks Special Products, Inc., Waukesha, Wisconsin. Grinnell-Saunders Diaphragm Valves are used as original equipment on these distillation units because they offer positive, leak-tight closure; flow control in throttling position; corrosion-resistance.

You'll find Grinnell-Saunders valves widely used in other fields, too . . . petroleum, papermaking, chemical, food, compressed air . . . to mention a few.

The operating principle of the Grinnell valve is the feature which makes it so adaptable. The diaphragm lifts high for streamline flow in either direction; seals tight for positive closure against grit, scale, solid matter, pressure or vacuum. Bonnet mechanism is completely isolated at all times from the fluid in the line by the diaphragm, preventing corrosion and contamination. Smooth passage, without pockets, eliminates trapping of solids and reduces frictional resistance. And you can get body, lining and diaphragm materials to meet your particular service conditions. Grinnell Company of Canada, Ltd., Edmonton, Montreal, Toronto, Vancouver, Winnipeg.

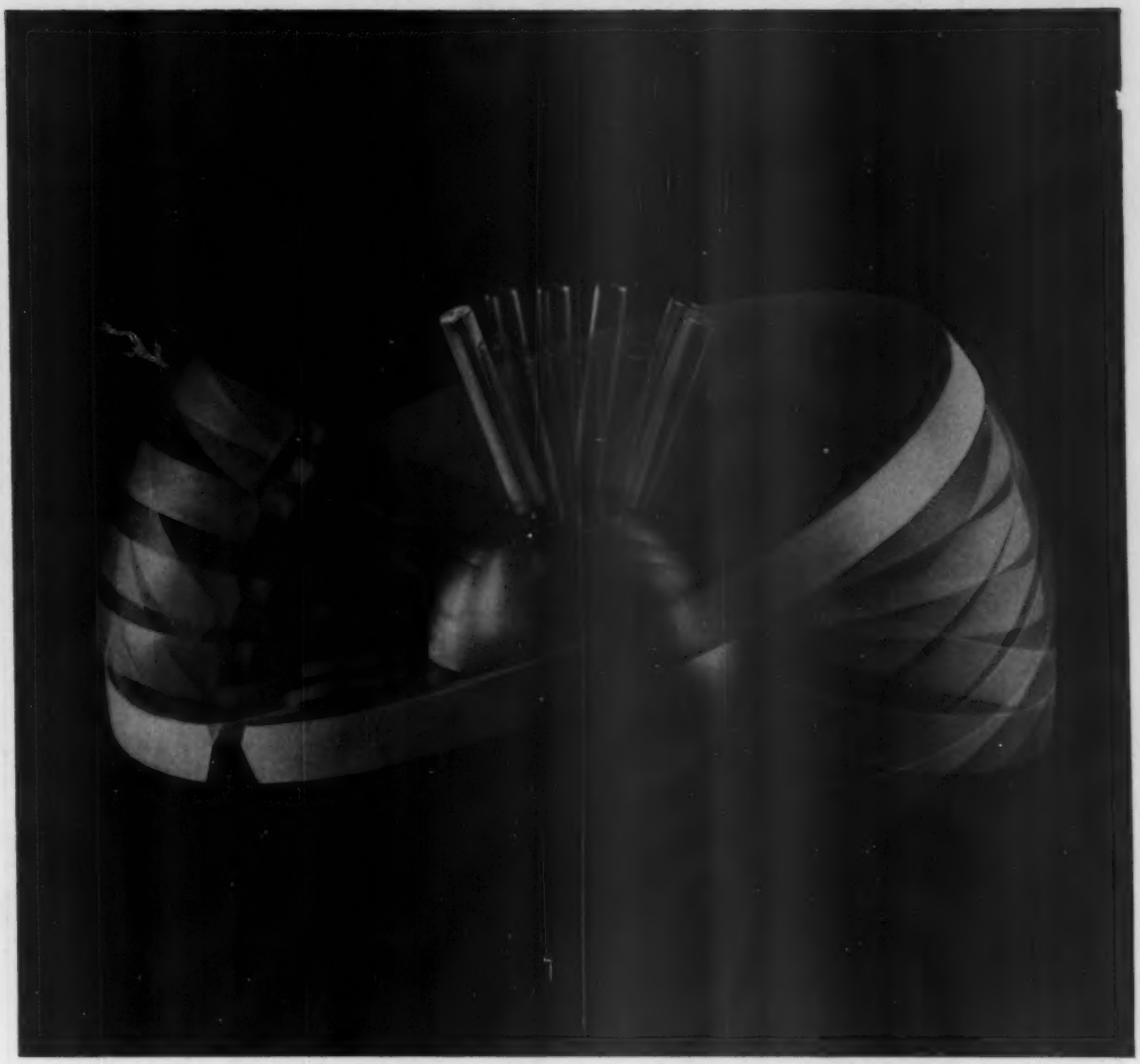




AT SEA The nuclear powered NS Savannah has two 16,000 gallons-per-day Cleaver-Brooks distillation units to supply the entire water requirements of crew and machinery. Each unit has two 4" Grinnell-Saunders Straightway Valves of ductile iron.

GRINNELL

Pipe, Fittings, Valves, Hangers, Heating and Piping Supplies
Branch Warehouses and Distributors From Coast To Coast



Why the **Hersey Conical Disc Piston** Gives You a More Accurate Meter

HERSEY DISC WATER METER — MODEL HF
Sizes ⅝" to 1" inclusive.

When you say to an engineer, "The Conical Disc Piston has the added strength of an arch" he quickly understands the significance of this exclusive design feature of Hersey small and medium sized disc meters. Because it logically follows that the stronger disc design permits a lighter construction which results in increased sensitivity.

In addition, the conical disc's center of gravity is slightly above the center of the ball, resulting in still further sensitivity over a flat shape. The Hersey Conical Disc Piston assures you of the continued accuracy that helps maintain maximum revenue. Write us for descriptive catalog No. H2.

Hersey-Sparling
Meter Company
HERSEY PRODUCTS
DEDHAM, MASSACHUSETTS

1985-OE

AST: MOVE AGAINST WATER POLLUTION

A growing population carries with it two closely related problems: waste disposal and water pollution. To solve one is often to solve both problems, for the pollution of lakes and rivers results from the lack of economical ways to otherwise dispose of harmful waste.

A.S.T. (Atomized Suspension Technique) is an important step towards solving both problems. Waste disposal basically is a three step process: separation of solids from liquid waste followed by treatment of each. A.S.T. reduces the solids to odorless, inorganic ash in less than a minute, eliminating the usual digestion tanks and drying beds.

An A.S.T. unit requires very little space and its operation is virtually automatic. There is no handling of sludge.

The first of these units was recently designed and built by National Welding Co. Ltd. for the Town of Beaconsfield, Que. It is now in operation and will handle the sanitary sludge from an eventual population of 12,000.

The A.S.T. system can be adapted to any size community and is also eminently suited to the disposal of industrial wastes.

Inquiries are invited from municipalities, industries and their consulting engineers.

NATIONAL

AST DIVISION

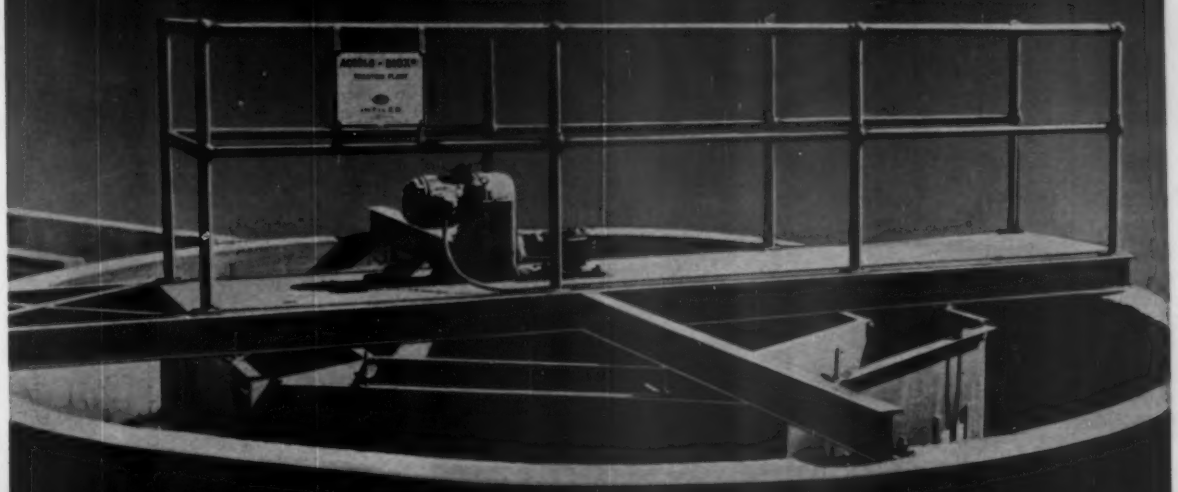
NATIONAL WELDING CO. LTD.

8235 Mountain Sights Ave., • Montreal, Que. • Tel. REgent 9-3241

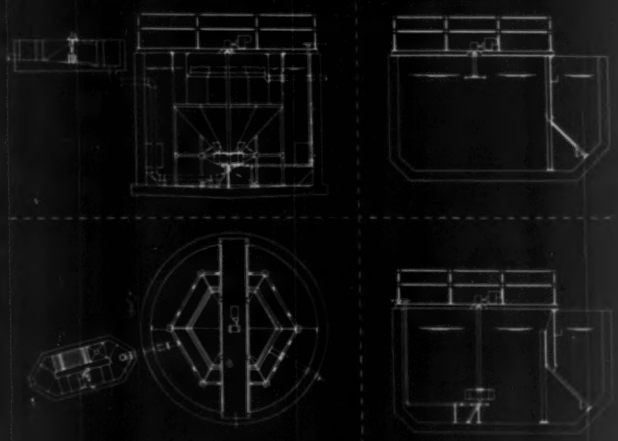
ECONOMICAL B.O.D. REMOVAL BY "TOTAL OXIDATION" SEWAGE PLANTS

for subdivisions, shopping centers, small municipalities, hotels, institutions, camps, resorts and similar projects

See your Consulting Engineer



Standardized ACCELO-BIOX® plants for total oxidation



Whatever your need may be for a small sewage plant, INFILCO offers you standardized equipment applications that are economical, efficient and compact. Available in steel and concrete tanks.

It will pay you to investigate. Write today for Bulletin 6520.

INFILCO

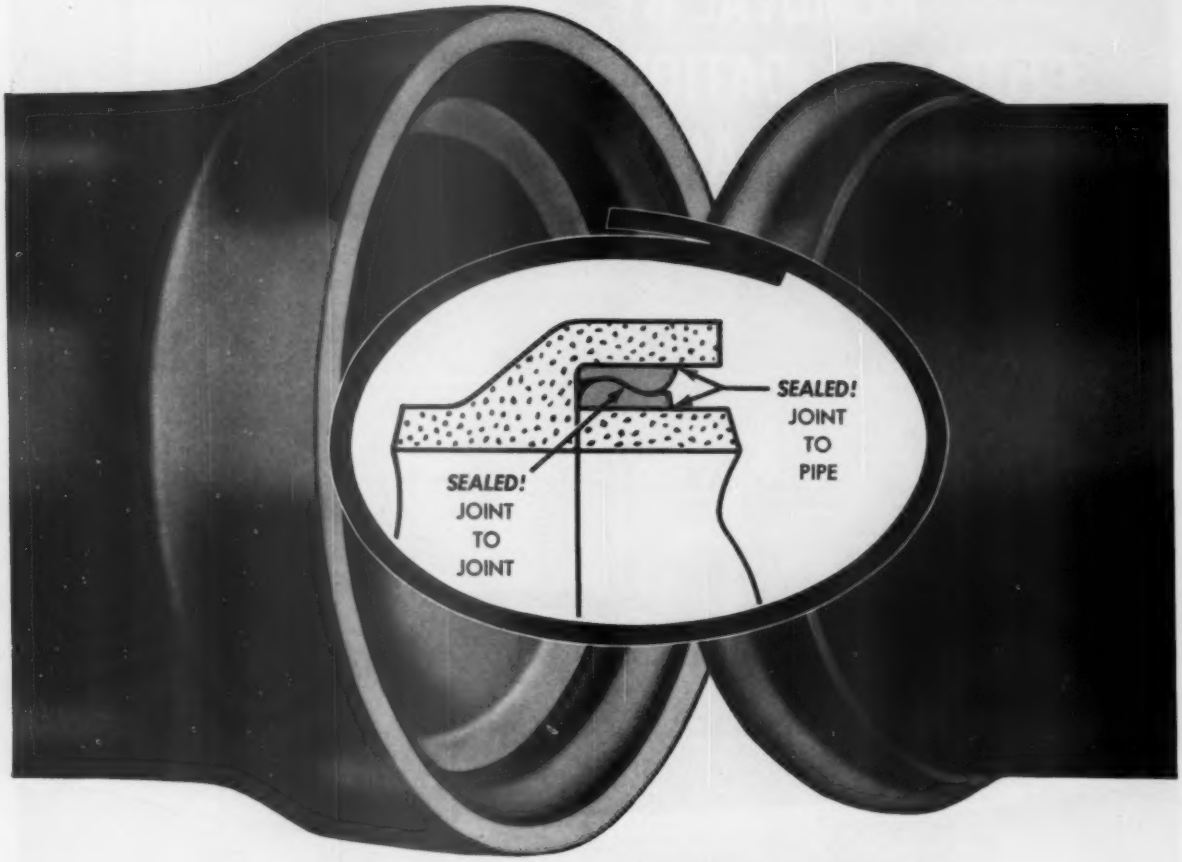
INFILCO INC.

General offices · TUCSON, ARIZONA

FIELD OFFICES THROUGHOUT THE UNITED STATES AND IN OTHER COUNTRIES

Wedge-Lock®

HANDLES INFILTRATION!



ROOT-TIGHT SEAL! ***MINIMUM INFILTRATION!***

Patented Wedge-Lock Joints are bonded to Vitrified Clay Pipe—*at the factory*—to bring you the highest performance standards . . . the lowest installation costs.

One simple, easy operation and the joint's tightly sealed around the full pipe circumference . . . stays in continuous compression for the life of the pipe. When you specify Wedge-Lock, you reduce infiltration and resist root problems before they start . . . keep installation costs down . . . benefit from the guaranteed performance of the world's longest-lasting pipe.

Write to listed manufacturers for literature or an actual Wedge-Lock demonstration

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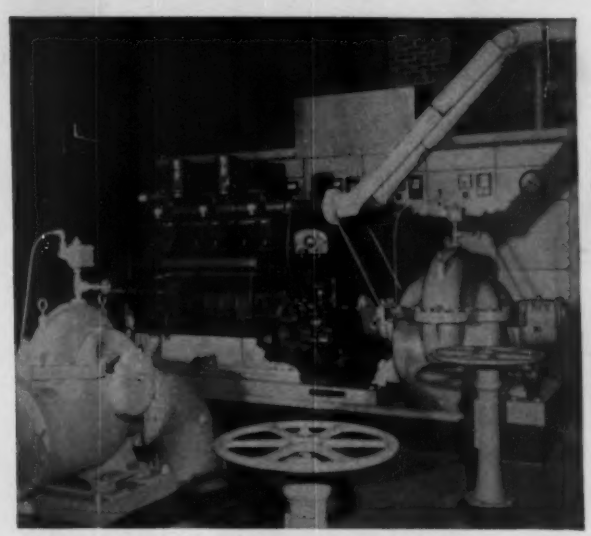

EAST—North Stamford, Connecticut—water pumping system.

COAST-TO-COAST

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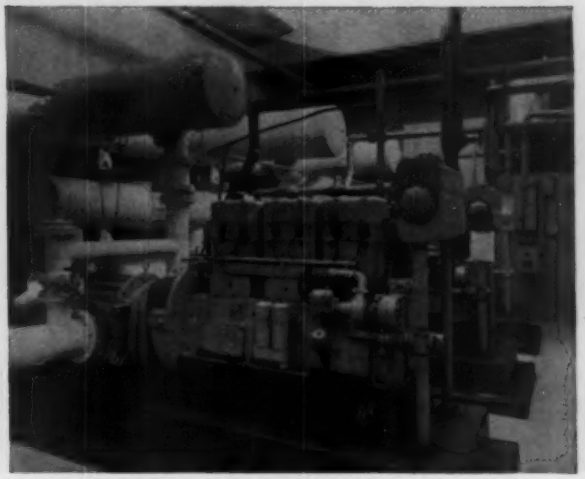
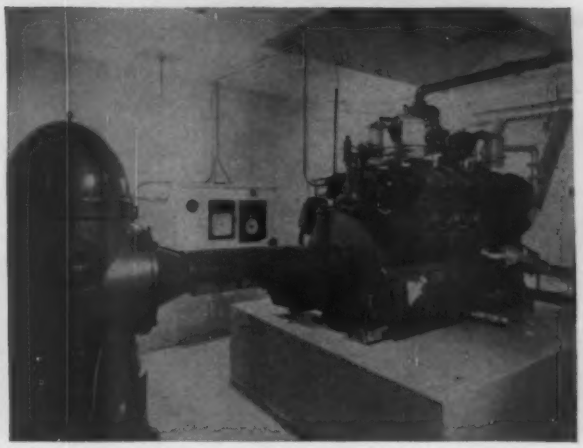


MID-CONTINENT—Waste disposal power in Enid, Oklahoma.



WEST—Rivera, California—deep well pumping power.

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H844	5¼ x 4⅞	8	844	644-1200	...	96	121	147	172	196	219	237	248	256
F1500	6¾ x 7	6	1503	1090- 600	125	165	200	215						
H2000	6¾ x 7	8	2004	1490- 650	170	225	270	290						
L3000	6¾ x 7	12	3006	2200- 700	250	335	405	435						
L3460	7¼ x 7	12	3468	2500- 900	285	380	474	555	592 @ 1350					
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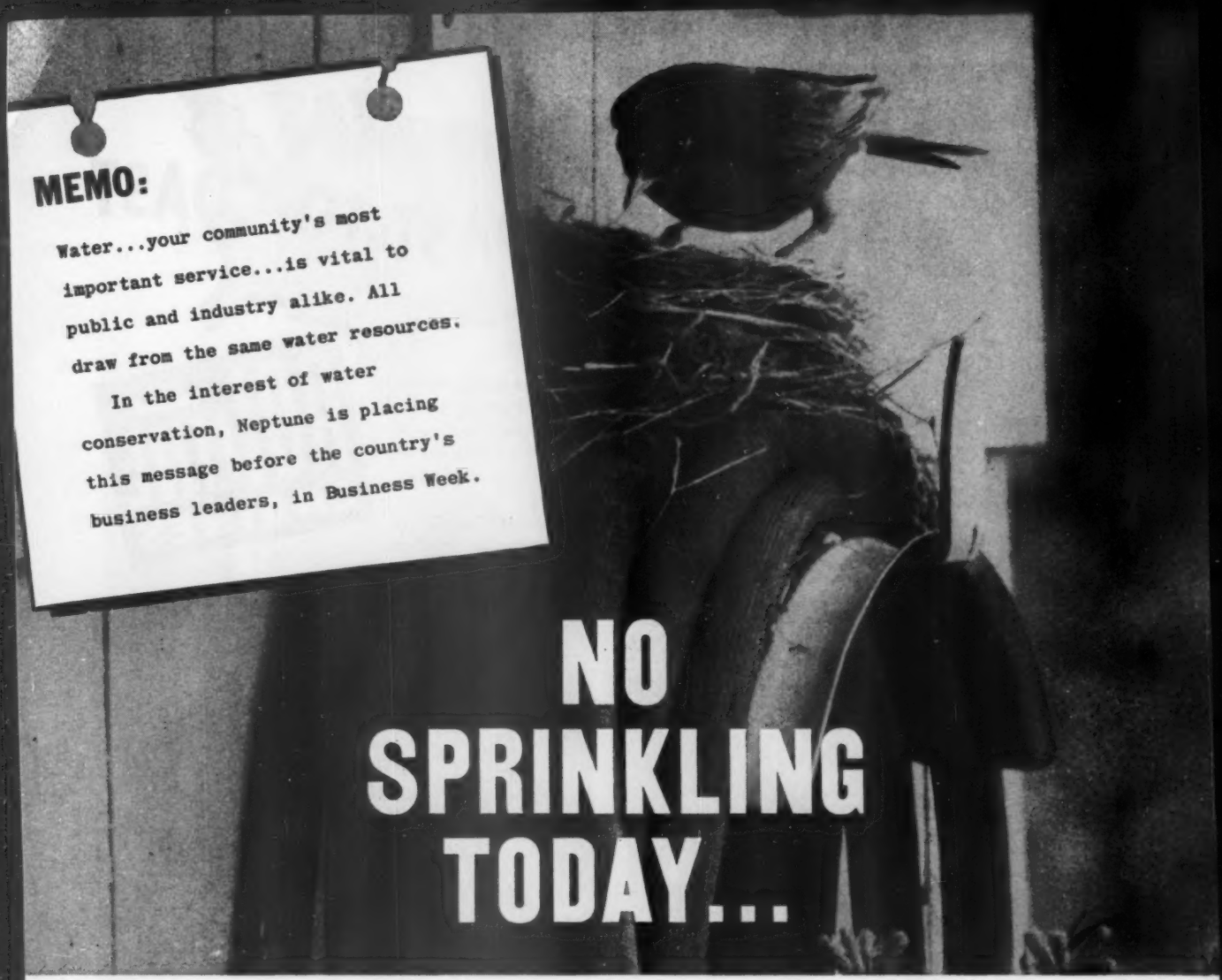
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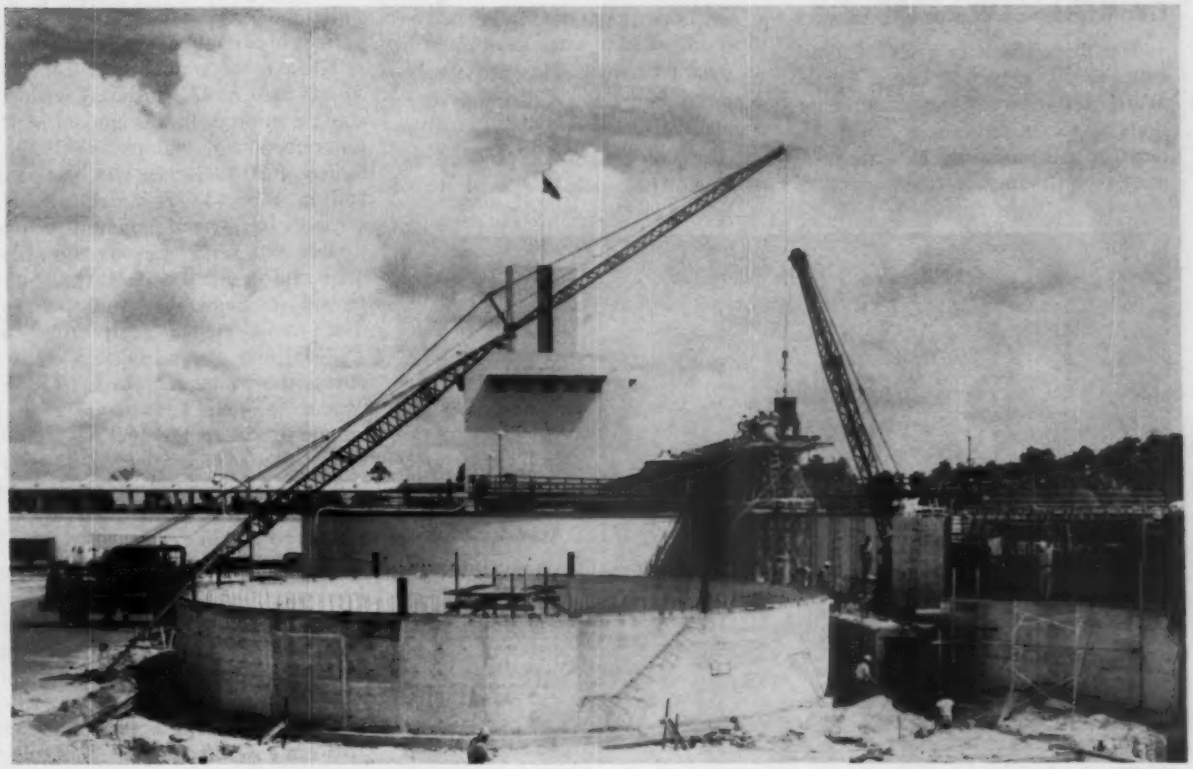
WATER & SEWAGE WORKS



This installation of two additional upflow softening units at the Alexander Orr, Jr. Treatment Plant are part of . . .

Miami's Master Water Plan
for current and future water needs

by: C. F. WERTZ, Director
GARRETT SLOAN, Chief Engr.
DAVID B. PRESTON,
Water Production Supt.,
Dept. of Water and Sewers
City of Miami, Florida

ED. NOTE: This Master Plan for the City of Miami, Florida's water utility future water needs, is one of the most comprehensive that has been brought to our attention.

Here is an actual working plan, complete to the last predictable statistic, from future needs to financing. All engineering and planning was done by full-time department personnel and generally follows a 20-year future planning period, with special emphasis on stage development of facilities.

■ MIAMI's Department of Water and Sewers has both an immediate and a long range future planning program for water supply system expansion. This program is the basic step in providing for future growth within one of the fastest growing metropolitan areas in the nation. In the past decade,

maximum day demands have increased almost one hundred per cent, from 65 mgd in 1949 to 125 mgd in 1959. The predicted maximum day demand for 1970 is 205 mgd, and for 1980 is 250 mgd.

Department of Water and Sewers

The Department is a semi-autonomous public agency operated by the Water and Sewer Board, and functions as a complete public utility enterprise with authority to issue revenue bonds to finance construction of facilities. Two large water treatment plants, distribution pumping stations and storage reservoirs and other waterworks facilities serve a present permanent population of approximately 560,000 in the metropolitan Miami area on both a retail and a wholesale basis. In addition to its water utility operations, the Department operates and maintains a large system of intercepting sewers, pumping stations, and a sewage treatment plant serving the City of Miami only. The water system investment is approximately $42,000,000 and the sewage project investment is approximately $27,500,000. It is necessary that the Department operate on an entirely self sustaining financial basis. Revenue bonds are issued which must be serviced entirely from utility income.

The Department of Water and Sewers was formed in 1941 in order to obtain a single water utility in place of City owned water treatment facilities and a privately owned distribution system. The rapid expansion and population growth of the area has presented many problems. Water system expansion has had to be carefully planned to meet financial limitations and yet satisfy the extremely rapid growth of demand.

The Department has always had engineering design work performed by its own personnel. This activity has required long range planning as a companion effort in order to outline the basic objectives for physical expansion. The work efforts, scope of study, limitations, and practical problems of the planning section are described herein as a matter of interest to other water utilities.

EXISTING HIALEAH PLANT, showing area for expansion.

Metropolitan Area and Water System

Miami is the principal city in the greater Miami area of Dade County which includes the cities of Miami Beach, Coral Gables, Hialeah and South Miami, the Towns of Miami Springs and West Miami, and several villages and large unincorporated areas. The Miami area is characterized by an extremely flat topography with a general elevation above mean sea level of ten to fifteen feet. There is a coastal ridge running generally from north to south ten to fifteen miles in width with Biscayne Bay and the Atlantic Ocean to the east and the low, marshy everglades to the west. There is a system of natural and man-made watercourses and canals throughout the area, and this drainage system is constantly being expanded to permit reclamation of low land for urban development. Water controls are provided within the drainage system and these are extremely important in preventing salt water intrusion of well fields during periods of drought.

The average annual rainfall for the Miami area is 47.2 inches. Considerable variation from this amount is not uncommon, for example, in 1959 a figure of 90.90 inches was recorded, and in 1956, 33.75 inches was recorded. In general, there are two pronounced rainy seasons, the first occurring in April and May, and the second in September and October. The mean annual temperature is 75.7°F, and the mean temperature during the winter months is 69.9° F. Miami is well known as a year around tourist center. It is not so well known that it has a diversified economy, has developed considerable light industry, and supports a large, permanent population.

There is excellent opportunity for development of ground water supply within this area. Wells drilled to depths of one hundred feet or less in the characteristic, porous limestone yield large volumes of water with slight drawdowns. In one of the Department's well fields located 14 miles southwest of downtown Miami, wells are designed to be pumped at a rate of 7 mgd, and it is not uncommon to see operating yields of 10 to 12 mgd per well when only 2 or 3 of the wells are in use. As would be expected, water obtained from the limestone formation is hard. This hardness is principally in the form of calcium bicarbonate, the total hardness varying from 220 to 250 ppm as calcium carbonate. The iron content varies from 0.15 to 1.2 ppm. In the well field southwest of Miami, low ground water color in the range of 10 to 15 is encountered. In the Department's other major well field located some 10 miles to the northeast of the above mentioned well field, ground water colors are in the 40 to 60 range. Treatment consists of lime softening and filtration, and breakpoint chlorination is employed where needed for color reduction.

The Department operates two main treatment plants, the 60 mgd Hialeah Water Treatment Plant located 7 miles northwest of downtown Miami

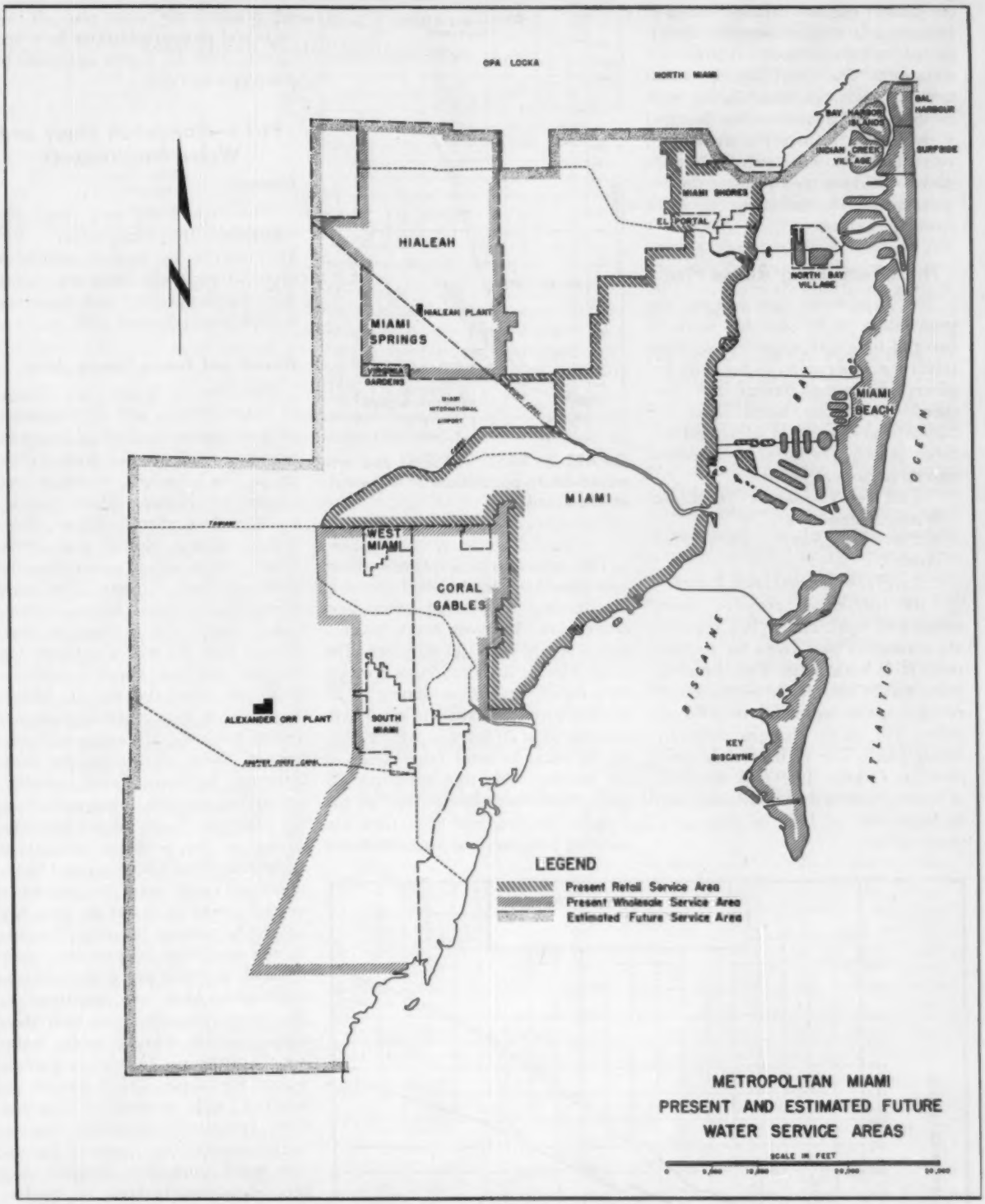


CHART 1. RETAIL AND WHOLESALE areas served by the greater Miami Water Department and the estimated future limits of service.

and the Alexander Orr, Jr., Water Treatment Plant, currently being expanded to 100 mgd, located 10 miles southwest of downtown Miami. The Hialeah Plant, served by 23 wells, furnishes water directly to two wholesale customers, Hialeah and Miami Springs, and also pumps into a low pressure, transmission main system to remotely operated high pressure pumping stations and storage facilities. The Orr Plant, served by 17 wells, pumps directly at high pressure into transmission mains leading directly into the downtown area. South Florida has a long huricane season extending from June through November; therefore, extensive use is made

of diesel engine driven pumping equipment to sustain operation during periods of outside electrical power interruption. The Orr Plant can maintain full scale operation during such periods. The Department has operated a recalcining plant for a number of years and this plant currently produces sufficient lime to meet the requirements for softening at both treatment plants.

The Miami Long Range Plan

The Department has assigned the preparation of its planning work to two full time civil engineers working under the supervision of the chief engineer. Planning reports are prepared in sections based upon the logical development of ideas and the three principal efforts are grouped into three parts as follows:

Part I—"*Population Study and Water Requirements*".

Part II—"*Supply and Treatments*".

Part III—"*Distribution System*".

Each of these requires many months of work and it has required approximately two years for completion. It is anticipated that these reports will be completely reviewed and revised again beginning in 1963 to reflect the many changes currently taking place. The plan recently completed in October 1959 took the place of another which had been completed in September of 1955 or some four years earlier.

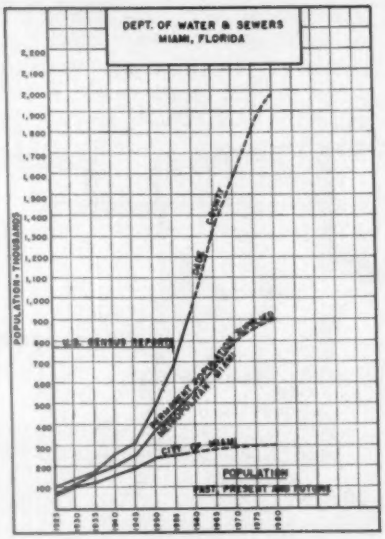


CHART 2. PAST, PRESENT and estimated future populations of the greater Miami area.

The growth characteristics of an area should be an important factor in determining the period of a long range plan. In most areas, such a period would be 30 to 40 years. The south Florida area has been growing very rapidly and is continuing to do so. The proportionate rate of growth anticipated in 20 years is greater than for 40 years in most other areas of the country. For this reason, a 20 year period, establishing 1980 as the design objective, has been used for planning purposes. As an aid to making practical use of the plan, all forecasts and recommendations have been on the basis of 5 year intervals beginning with 1960.

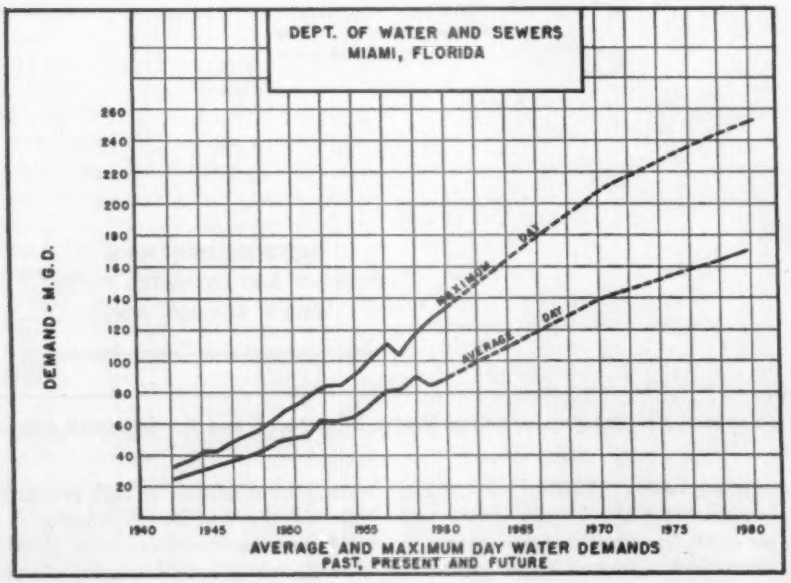


CHART 3. PAST, PRESENT and estimated future average and maximum day water demands.

Part I—Population Study and Water Requirements

General

This part of the long range plan establishes the Department's 1980 service limits, studies population growth trends, and estimates average day, maximum day, and maximum hour demands through 1980.

Present and Future Service Area

The City of Miami, the Villages of Miami Shores and El Portal and adjacent unincorporated areas are the principal retail service areas (Chart #1). The principal wholesale customers are Hileah, Miami Springs, Coral Gables, South Miami, West Miami, Miami Beach, and private water companies in unincorporated areas of Dade County. The retail areas, Miami Beach, Miami Springs, Coral Gables, and portions of South Miami and Hialeah are highly developed, and thus major growth extends out from the nucleus formed by the above areas into unincorporated county territory. The estimated future service limits shown on the map, although arbitrary, were carefully selected to establish a reasonable basis for planning. North Miami and Opa Locka on the northern limits have their own water systems. Land to the northwest and west of estimated service limits is extremely low and subject to seasonal flooding. The area to the southwest is primarily agricultural. In recent years, several large subdivisions have been constructed in the unincorporated areas with their own privately owned public water supply systems. However, unless water for these subdivisions is softened, with removal of iron and color, considerable consumer dissatisfaction results. Thus, some of the private water companies' supplies have been abandoned in favor of the Department's supply, one of the more recent having some 1,400 customers. The Department has an extension policy and many new developers install extensions to the Department's system. There is no exact pattern for growth in the unincorporated area nor for the connection of existing subdivisions to the Department's sys-

Table I

Total Future Water Requirements

Year	Average Population Supplied	Average Daily Demand M.G.D.	Maximum Daily Demand M.G.D.	Maximum Hour Demand M.G.D.
1960	631,000	95	142	213
1965	739,000	115	172	258
1970	872,000	140	209	314
1975	938,000	155	232	348
1980	982,000	167	250	376

tem. Also, although much of the land to the west and northwest of estimated future service limits is low and unsuitable for development, a major reclamation program could render it suitable for building.

Population

Population growth curves (Chart #2) are shown for the City of Miami, Dade County, and the area within estimated future service limits. There is little vacant land left within the city limits and this accounts for its slower rate of population growth. However, a distinct trend within the city toward increased population density has developed as small buildings are replaced by large, multi-unit structures. The extremely rapid growth of the overall area is well illustrated by the population growth curve for Dade County. In addition to the metropolitan area population study, detailed studies were made by the Department within the various communities and areas. Also, it was necessary to make special study of tourist population within the Miami Beach area. It was found that the permanent population of Miami Beach has been increasing at an annual rate of 1½ per cent while the tourist population has increased at a rate of 7 per cent per year. In addition, it was found that the residential population within Miami Beach increased by 150 per cent during the peak tourist season. Population estimates are based on past U. S. Census figures and various local supporting data such as increase in electrical customers, birth and death rates, and new building permits .

Water Demands

The prediction of future water demands for the overall area and the individual sections is based upon the Department's water consumption records and population data. Analysis of past records shows an increase in per capita water consumption and this must be provided for in predicting future demands. For the average population supplied, it is estimated that average daily per capita demands will rise from 150 gallons in 1960 to 170 gallons in 1980. It is predicted, also, that per capita demand estimates will adequately account for water needs of future industry which is expected to be of the prevailing, low water demand type. Chart No. 3 shows the past, present, and estimated future average and maximum day water demands. Future water requirements are shown in Table No. 1 for five year periods through 1980.

Part II—Supply and Treatment

General

This part of the plan develops the desired location and size of a third water treatment plant with proposed well fields, treatment plant, type of treatment, and transmission mains. In order to determine the most economical plant site, alternate studies were made of two comparable and feasible plant sites. After making careful cost estimates for each project and evaluating operating costs, a site adjacent and north of the existing Hialeah plant was selected. Last year this site was purchased and preliminary plans for a new plant are now being studied, in advance of design.

Size and Location of Future Plant

It was necessary to analyze the water demands of the entire future service area and allocate those portions which would be served most economically by the two existing plants. Table No. 2 shows how these future demands were allocated, and it was found that the future demands were principally in the areas now served by the Hialeah plant and other areas further to the north. Thus, the most favorable location for a third plant could be an addition to the present Hialeah plant, or a new plant at the northwestern corner of the service area. The ultimate nominal

Table No. 2

Allocation of Maximum Day Demands to Treatment Plants

(in Million Gallons per Day)

ORR PLANT	1960	1965	1970	1975	1980
1. City of Miami (Part)	42.3	51.0	53.6	48.2	41.8
2. West Miami	0.9	0.9	0.9	0.9	0.9
3. West County (Part)	1.0	1.9	3.0	3.9	5.1
4. Consumers Water Co. & South County	15.0	19.7	28.2	32.1	36.9
5. Key Biscayne	1.4	1.7	2.3	2.9	3.3
6. Miami Beach (13th & 15th St.)	12.0	12.0	12.0	12.0	12.0
7. North County	8.3	12.8	—	—	—
TOTAL FROM ORR PLANT (To be 100 MGD after 1960)	80.9	100.0	100.0	100.0	100.0
HIALEAH PLANT					
1. City of Miami (Part)	19.5	15.3	16.9	26.0	36.0
2. Miami Shores	2.2	2.4	2.6	2.7	2.8
3. El Portal	0.5	0.5	0.5	0.5	0.6
4. North County	1.4	5.1	31.2	39.0	41.6
5. West County (Part)	—	1.9	2.9	3.9	5.1
6. Hialeah	11.6	14.0	17.0	18.0	19.2
7. Miami Springs	3.2	3.5	3.6	3.9	4.2
8. Miami Beach (79th St.)	15.6	17.1	19.4	21.5	22.0
9. Miami Beach (36th St.)	6.0	10.0	13.0	16.0	20.0
TOTAL FROM HIALEAH PLANT	60.0	69.8	107.1	131.5	151.5
Total Nominal Rated Hialeah Plant Capacity	60.0	60.0	60.0	60.0	60.0
Additional Plant Capacity Required	—	9.8	47.1	71.5	91.5
TOTAL MAXIMUM DAY DEMANDS	140.9	169.8	207.1	231.5	251.5

capacity of the proposed third plant was estimated to be 100 mgd.

Each of these two general locations afforded one suitable plant site, (Chart # 4) and it was selected as the basis of alternate studies for purposes of an economic comparison. At each of the sites, a study was made of water supply from wells. It was interesting to find that wells of smaller capacity would be obtained at the northernmost or Gratigny Road site but the higher costs were offset somewhat because a well field could be developed adjacent to the plant. At the Hialeah site, wells were of greater capacity, but only a small field could be safely developed on the plant site because of its proximity to the existing salt dam on the Miami River. The necessary well fields for the Hialeah Plant site were found to be located several miles to the west requiring a transmission main and increased pumping costs.

Available Well Fields

Records and chemicals analyses from existing wells in the vicinity of each alternate plant site were examined in order to determine the safe capacity of the proposed well field and the quality of the water. Data compiled by the U. S. Geological Survey's continuing field study program in Dade County were used as a basis for estimating the drawdown characteristics and safe capacity of each proposed well field.

It was found that the Gratigny Road site afforded reasonable safety from salt intrusion for a 100 mgd well field. However, the more sandy sub-surface conditions limited the

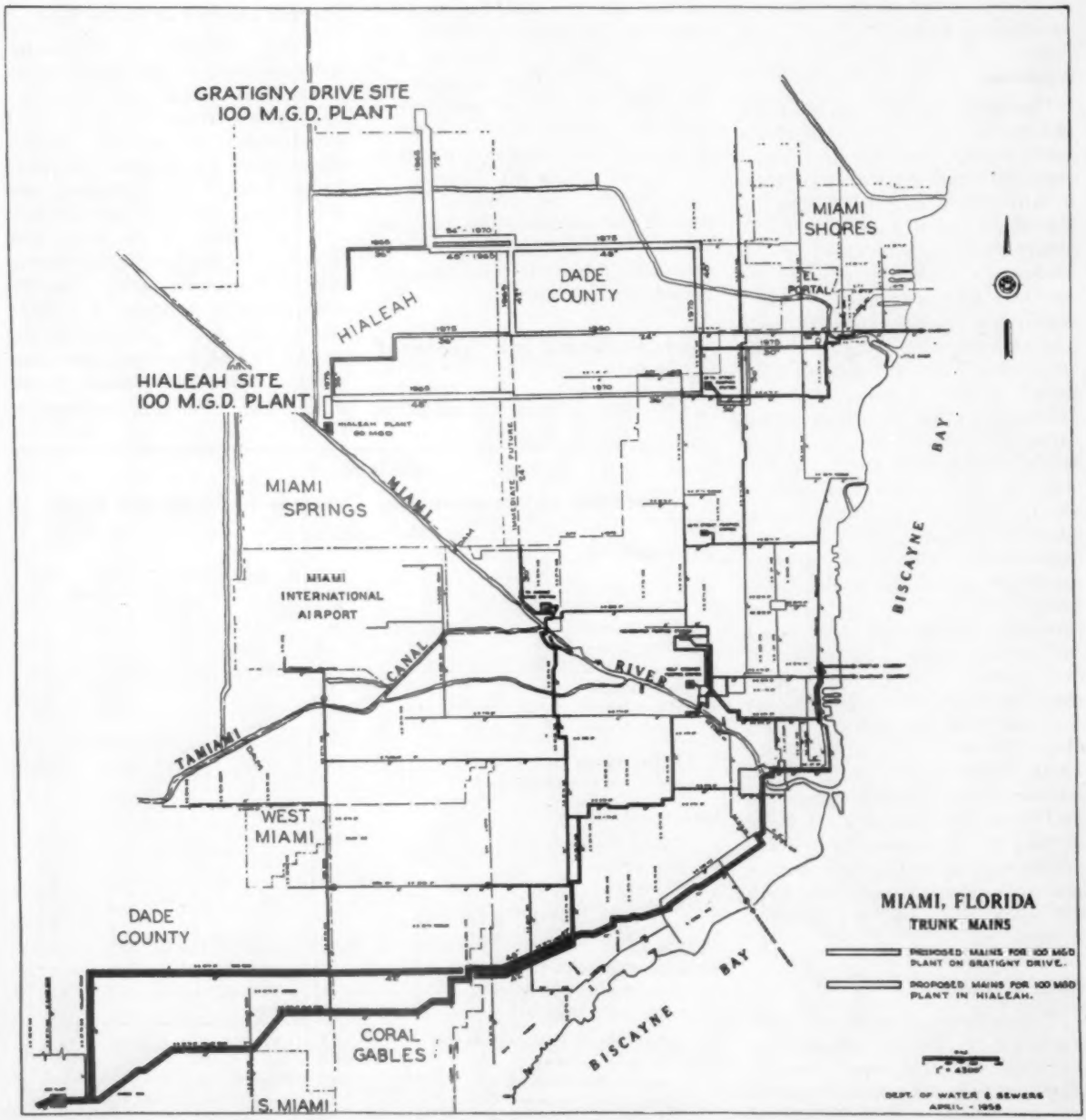


CHART 4. MAP OF GREATER MIAMI system showing two alternate sites and related demands.

capacity of each well to 3 mgd and increased spacing to 800 to 1,000 ft. Thus, the costs for developing a well field of 100 mgd capacity were estimated (1959 basis) to be $772,000.

Studies of proposed well fields at Hialeah indicated that spacing of 300 to 400 feet would be satisfactory and that each well should yield at least 3.5 mgd. The general area is greatly favored by recharge from a number of canals connected to the Miami Canal, which drains large areas of the everglades. It has been estimated that at least 78% of the water pumped from the existing well fields is supplied by the Miami Canal through recharge.

The Department owns some three square miles of land in the everglades, some 7 miles west of the proposed Hialeah plant site. This land was originally purchased as a site for future well fields. It was found to be uneconomical to locate a well field so far to the west because of the high cost of long transmission mains and pumping. However, a well field location approximately 2 miles west of the Hialeah plant site was found to meet all requirements for a future source of supply.

ATTRACTIVE RELIEF MURAL decorates front wall of Miami's newest water plant.

Treatment

All ground water in the Miami area is quite hard, varying from 220 to 250 ppm of total hardness. Lime softening is the most commonly used method of treatment for removal of hardness and iron.

One other important characteristic of the ground water in considering treatment is color. Most areas south of the Tamiami Canal have only small amounts of color in the water so that no special treatment provision is required for its removal. However, in both areas north of the Tamiami Canal which were under study for this planning report, a high color, ranging from 60 to 100 ppm, was known to prevail. Removal of the remaining 25 to 30 ppm of color after lime softening is accomplished by a super-chlorination dosage of 90 lbs per mg, or approximately 11 ppm. Since both alternate plant sites under study afforded water of similar characteristics for treatment, both plants were planned to have the same design features, which were similar to the Department's Alexander Orr, Jr., plant with upflow softening units, recarbonation, chlorine contact tank, filter and storage. It should be noted that a chlorine contact tank as operated at the Hialeah plant is required for purposes of color removal.

Pumping and Transmission

The design of pumping and transmission mains from the Gratigny Road site were sized for a 100 mgd plant and provided for a 150 mgd peak hour. It was anticipated that future peak hourly demands of the designated service area would be met by the proposed facilities with no benefit from existing mains or pumps. In order to provide for stage construction, only a portion of the total number of high pressure pumps would be required and the transmission main was designed with two feeders forming a loop. One problem was that of serving the City of Hialeah, where all existing mains have been designed to distribute water from the existing plant situated some four miles southwest of the proposed Gratigny Road site. Obviously, the City of Hialeah would be required to redesign its system to receive its future supply from an entirely different location.

The Hialeah site offers several advantages for high pressure pumping and transmission mains. By interconnecting clear wells of each plant, the existing pumping capacity of the old Hialeah plant can be used to greater extent. This is especially true of the low pressure pumps, because the increasing high pressure demands have gradually decreased the volume of water normally available for low pressure pumping. In recent years, additional high pressure capacity has been required so that all high and low pressure pumps have far greater capacity than the plant could supply.

Proposed high pressure mains from a new Hialeah plant will be smaller than normally required, because the presently unused capacity of low pressure pumps and transmission mains can be re-employed in the future when a new plant will supply sufficient water. These proposed mains will also be more adaptable to stage construction and flexibility of operation.

Selection of Future Water Plant Site

A detailed preliminary cost estimate was prepared for each of the two comparable alternative plant site projects, and these costs are summarized

Table No. 3

Comparative Estimated Costs For 100 MGD Facilities

ITEM	HIALEAH SITE	GRATIGNY DRIVE SITE
1. Wells	$ 728,000	$ 772,000
2. Supply Mains	1,533,000	1,151,000
3. Treatment Plant	8,300,000	8,300,000
a. Sludge Lagoon (Sale of Sand)	—	(35,000)
b. Sludge Piping	18,000	7,000
c. Additional High Pressure Pumps to Supply City of Hialeah	—	195,000
4. Transmission Mains	3,010,000	3,721,000
5. Land — Plants & Wells	250,000	125,000
Additional Wells	50,000	—
Improvement	20,000	—
6. Clear Water Reservoir Interconnection	78,000	—
7. Railroad Siding	20,000	52,000
TOTAL	$14,007,000	$14,288,000

on Table 3. The difference in these estimated costs is so small that a decision favoring either project could not be made on the basis of cost alone.

A comparative analysis was then made of the estimated operating costs of each plant. Several obvious economies favor the Hialeah location because of combining certain operating functions and eliminating transportation of lime. The annual saving represented by these economies was estimated to be $23,500 on a very conservative basis.

Several "intangible" considerations have been taken into account also, as follows:

(a) Future growth of the City of Hialeah will most probably extend to the west at a rapid rate. The Hialeah site would be at a more central location to serve the City's future demands.

(b) The Department's long term contract with the City of Hialeah provides for all supply to be delivered at the existing plant site. Use of the Gratigny Road site would require an alteration of this contract.

(c) The Hialeah site affords the interconnection of both raw water and high pressure plant discharge between the existing and proposed plants. This flexibility is an important consideration for good operation.

(d) The existing low pressure transmission mains and pumps can be used to their full capacity in the future. This could not be done if future capacity were provided at Gratigny Road.

(e) The proposed construction of a new plant in stages can be accomplished much better at the Hialeah site due to the use of interconnections. Funds for this work will become available in limited amounts so that stage construction is an important consideration.

These various considerations have led the Department to decide upon the Hialeah site for its future plant expansion.

Part III—Distribution System

General

This part of the planning report consists of an analysis of the Department's distribution facilities and develops a Master Plan for their improvement and also for the future service area through 1980. Considered under the above are treated water pumping, transmission and storage facilities based upon the selection of the third plant at Hialeah. A schedule for new construction with cost estimates is prepared for five year increments through 1980.

Existing Facilities

In the analysis of the Department's distribution system, it was apparent that much 2 inch diameter pipe and smaller remained from installations made many years ago. The Department, realizing this deficiency, has had a gradual program for a number of years to replace undersized mains. To strengthen the system for future needs, it was obvious that a determined effort should be made to locate required larger mains in areas now served by mains smaller than 2 inch, and to continue the gradual program for their replacement.

Fire Protection

The City of Miami Fire Department is responsible for fire protection facilities within the City and maintains a separate, high pressure fire system of mains in the high value or downtown area of the city. In the remaining area of the city, the Fire Department installs and maintains fire hydrants on the Department of Water and Sewers distribution system. In El Portal and Miami Shores, their municipal fire departments install and maintain hydrants on Department mains. In the unincorporated county areas, there is no public authority responsible for installation and maintenance of hydrants. Although, under the terms of its Trust Indenture, it cannot assume responsibility for furnishing, installing or maintaining fire hydrants, the Department takes the stand that the distribution system should be adequately sized for future hydrant installation and fire flows.

Design Basis

In designing the distribution system, future estimated water demands were allocated to theoretical districts of the service area on the basis of population density and other area characteristics. Actual main sizes were determined using water demands equal to the maximum day plus fire protection, or peak hour demands, whichever was the largest. Standards of the National Board of Fire Underwriters were followed.

It was found advisable to design a standard grid system to follow the street pattern of a typical square mile residential section in Dade County. Each typical section is subdivided into 660 ft. by 330 ft. blocks and has main traffic arteries along the one mile section lines. This grid pattern was useful in preparing an overall area water distribution plan, although, as would be expected, occasional changes were required because of varying physical characteristics of the area.

Master Plan and Construction Schedule

An overall system Master Plan was prepared and incorporated into plans of the entire service area with scale of one inch to the thousand feet. These drawings show existing and

future mains, 6 inches in size and larger. The benefits of the Master Plan are discussed later in this paper. It is realized, of course, that unforseen circumstances will require modifications to this plan in the future.

In addition, a new construction schedule, in five year increments, showing approximate installation dates and present day costs has been prepared for the larger mains indicated in the plan. Omitted from this are mains which under the Department's extension policy would not be installed without financial contribution. This construction schedule would, of course, be expedited or delayed according to actual future growth trends.

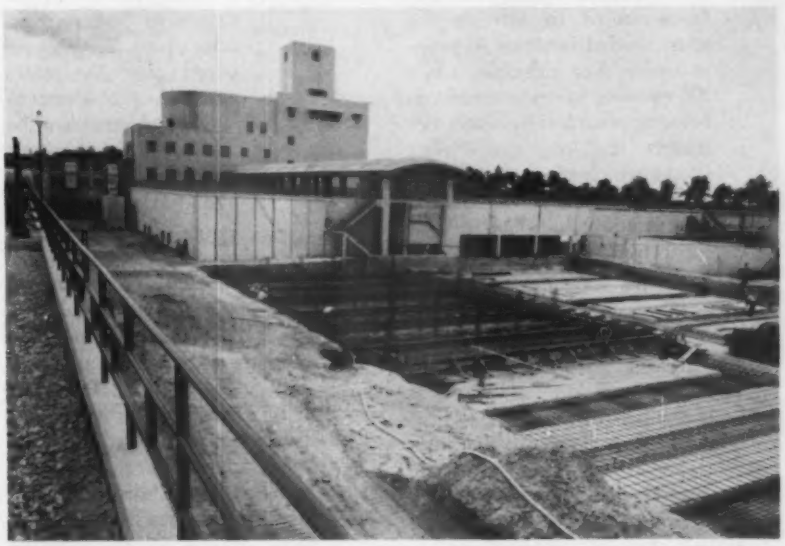
Pumping, Transmission and Storage Facilities

A detailed hydraulic study was made of the Department's pumping, transmission and storage facilities for each 5 year maximum day through 1980. Its purpose was to insure that all portions of the service area including wholesale customers would be adequately served during peak operating conditions. The study indicated the approximate future service areas of each of the Department's major pumping stations including the pumping station for the third plant and consequently showed when new pumps would be required. Throughout his effort, particular attention was paid to maintaining reserve capacity of pumping units under maximum load conditions.

At present, high pressure pumps at the Alexander Orr, Jr., Water Treatment Plant discharge into two 48 inch transmission mains extending into the City of Miami from the southwest. There are four 15 mgd and one 30 mgd diesel operated pumps in the station for this plant at the present time. The study indicated that an additional 40 mgd pumping unit would be required in the 1960-65 period, and another in the 1965-70 period.

The original pumps at the Hialeah Water Treatment Plant discharge into a low pressure system consisting of one 36 inch and two 42 inch mains. The low pressure system is looped and connects to storage facilities and pumping stations located in the north, north central, and central areas of the high pressure distribution system. There are also high pressure pumping facilities at the Hialeah Plant for direct service to two wholesale customers, the City of Hialeah, and the Town of Miami Springs. It is planned that pumping facilities for a third water treatment plant located adjacent to the present Hialeah Plant will be used in connection with those at the present plant to serve the growing demands of the City of Hialeah, and will in addition supply the high pressure service for the northern portion of the overall service area.

The study showed that for the third treatment plant, two 15 mgd pumping units would be required in the 1960-65 period and one 30 mgd unit in each of the three remaining 5 year periods through 1980. Also indicated were the needs for future storage at the Hialeah Plant sites, major transmission mains from the third treatment plant, and additional high pressure pumping units for the remotely operated pumping stations. Included as part of this study was a schedule up to 1980 for all major additions with estimated construction costs.



FOUNDATION WORK for the addition of 12 five mgd rapid sand filters at the Alexander Orr, Jr. plant.

Financing and Construction

Financing for water supply expansion is governed by the terms of the Trust Indenture prepared when the first water revenue bonds were sold for the purchase of the privately owned distribution system in 1941. The indenture stipulates that average annual net operating revenue for the two fiscal years immediately preceding a proposed revenue bond issue must be at least 140 per cent of the annual fixed charges of outstanding and proposed new bonds. This requirement for obtaining funds for new construction plus the very rapid growth of the area have had a pronounced influence upon planning and carrying out of plans. In effect, the result has been a series of numerous, but limited developments of facilities in stages, and it is vital that planning be geared to provide for both immediate future needs as well as long range future growth. The large scale construction of facilities to provide for the anticipated growth occurring many years in the future in a single expansion has not been possible. The management of the Department is extremely conscious of the occasional rainy year that may have the effect of reducing the size of surplus water revenues and thereby delaying sale of bonds. The rapid, stage development of facilities, however, enables the Department to perform its own engineering design work with a moderately sized, continuously employed staff.

What Planning Will Provide

When a long range planning effort is undertaken, the many obvious intangibles of future development loom large and they tend to detract and

discourage the planner. After a conscientious effort in long range planning has been made, its accomplishments can usually be listed in the following general terms:

(a) Basic design objectives will be established for the future needs of the entire system. Such objectives are: nominal capacity of water source and treatment plant enlargements or additions; transmission mains; storage units; location and size of principal feeder mains and pumping stations. Stage construction of such facilities in increments can also be established so that a balanced design is obtained when the ultimate plan is only partially completed.

(b) An order of priority will be established for the construction of all facilities. This will be arranged to provide the most needed facilities in proper order. For example, when the existing system capacity is being appraached by water demands, the long range plan shows which of several future projects should be undertaken to provide additional system capacity.

(c) For major facilities, planned in the near future, detailed design work can be authorized so that an adequate period will be available for such work. It is always good practice to prepare plans with deliberation rather than under pressure after the facilities are already deficient.

(d) Cost estimates for the proposed facilities can be prepared based on the general scope of the plans. Although such estimates require revision in the future, they will be valuable in estimating future financial requirements. Long range planning should include forecasts of financial conditions affecting the utility, such as limitations on indebtedness, estimates of future revenues and operating expenses, and estimates of future debt service.

(e) Reference outline plans of future production, storage transmission and distribution facilities can be made available for use in handling the following routine problems:

(1) Service to new customers beyond limits of the existing distribution system. The plan shows the sizes of future mains so that cost estimates of an extension can be readily prepared.

(2) Land developers and public agencies frequently inquire about planned water mains. The existence of definite plans showing sizes and locations of mains is invaluable in giving prompt replies to such inquiries.

(3) Express highway and major public works projects often require extensive water main relocations. With a prepared plan for reference, the solutions to such problems can be made quickly in terms of desired main sizes and locations.

(f) A long range master plan provides an "impersonal basis" for dealing with the public on matters involving large costs. It is normal for all parties requesting water distribution facilities to "talk down" the main size in order to reduce direct costs involved. With a long range master plan as a reference, such efforts can be discouraged because of the obvious impersonal character of a previously prepared plan.

(g) For economic reasons, it is usually desirable and necessary to procure sites for required facilities some years in advance. The preparation of a long range plan provides the justification, desired size, and location of sites for future facilities. Such facilities are well field areas, pipe line rights of way, plant sites, storage sites, etc.

What Planning Will Not Provide

At the outset of any long range planning effort, it is obvious that reasonable population growth estimates will be realized at some future date. However, determination of the exact *rate* of growth cannot be accurate because of the many unknowns. Thus, there is only limited accuracy in estimating future dates for realizing increased populations. Several other characteristics of long range planning that cannot be established with any real accuracy are as follows:

(a) Future water demands will be closely related to population so that the estimating of future dates is subject to the same basic inaccuracies as for future populations.

(b) Although reasonable population growth estimates can be made for a metropolitan area, the locations for future development of land can be made on only a general basis. It is characteristic for certain large tracts to be held undeveloped by speculators while areas of urban development "finger" out, far beyond the general area limits. For this reason the installation of larger distribution feeder mains should be withheld until definite development of land for residential use has taken place.

(c) Long range financing such as bond issues cannot be scheduled far into the future. They must be considered to be flexible as to future dates depending on how rapidly the growth actually takes place. In general, a financing program must be geared to actually "*experienced*" growth in water demands and expansion of the distribution system.

(d) Certain special developments, such as the establishment of a large industry, obviously cannot be included in a long range master planning effort. When such unusual growth occurs, the existing future plans must be revised to provide for its effects.

The above listed shortcomings are inherent in any long range planning effort. It has been found, however, that the advantages of having and following a plan far outweigh the lack of one.

Summary

Metropolitan Miami is experienc-

ing a rapid rate of population growth. This growth rate is expected to continue for many years. The Department of Water and Sewers of the City of Miami is the principal water utility in the metropolitan area. Planning for future water demands is an essential part of this Department's program.

The Department maintains a full time engineering planning section. A 20 year future planning period is observed. Special emphasis is placed on stage development of water supply facilities because of rapid area growth.

The Department's most recent planning study was completed in 1959. This study was divided in three basic parts: I. "Population Study and Water Requirements", II. "study and Treatment", and III. "Distribution System".

In Part I, the average day, maximum day, and maximum hour water demands through 1980 were estimated at 5 year intervals for individual sections of the service area, as well as for the overall service area.

Part II, is a study to determine the most feasible way to provide additional supply and treatment facilities. The site for a third water treatment plant with proposed future nominal ultimate capacity of 100 mgd was selected. This site has already been purchased. The site for a future well field to serve the third plant was established. Future supply and transmission mains for the third plant were located along preliminary routes.

Part III, is a study of the Department's present and proposed future distribution system. This study included an analysis of treated water pumping, storage and transmission facilities. A Master Plan was prepared for improvement of existing distribution facilities and for development of new distribution facilities. A schedule for development of pumping, storage and transmission facilities was also prepared.

The estimated total cost through 1980 for major additions to the Department's supply, treatment, and distribution facilities, based on present day prices, is $25,000,000. A schedule for development of major additions with costs is shown in Table No. 4.

Table No. 4

Summary of Estimated Costs of Major Additions to Supply, Treatment and Distribution Facilities

ITEM	Present to 1960	1960-65	1965-70	1970-75	1975-80	TOTAL
Distribution Mains 12-inch & Larger	*	$ 519,000	$1,101,000	$ 574,000	$ 734,000	$ 2,928,000
Distribution Mains Less than 12-inch	$200,000	1,000,000	1,000,000	1,000,000	1,000,000	4,200,000
High Pressure Pumps Other Than 3rd Treatment Plant	*	480,000	350,000	—	120,000	950,000
Orr Plant Supply and Treatment	—	—	3,500,000	—	—	3,500,000
Expenditures for 3rd Treatment Plant at Hialeth (See Part II)	768,000**	5,672,000	2,831,000	3,363,000	1,123,000	13,757,000
TOTAL COSTS	$968,000	$7,671,000	$8,782,000	$4,937,000	$2,977,000	$25,335,000

* Costs included in current budget.

**$250,000 for land previously expended.

Orr Plant Supply and Treatment Estimate:

20,000 ft. 60-inch supply main at $60 =	$1,200,000
6 Wells complete	400,000
2 Additional Softening Units	300,000
Miscellaneous	100,000
Lime Plant	1,500,000
	$3,500,000

The direction of the Department is under the Water and Sewer Board whose members are J. E. Preston, Chairman, Fred W. Borton, Charles A. Thomas, Harry C. McCartha, Jr., and Thomas B. McGahey, Jr. Paul M. Kiel represents the Department's Consulting Engineers, Day and Zimmermann, as Resident Engineer. The Department's Planning Engineers are H. W. Mandeville and Walter E. Dinn.

Natural Purification of Rivers to be Studied

Nature's own method of fighting river pollution will be the object of a three-year investigation conducted by the University of Michigan, School of Public Health. Scientists are planning an intensive "health examination" of two Michigan rivers, and from their findings, they hope to aid the stream's natural, self-purification process. The United States Public Health Service has approved a three-year grant of $52,669 to support study.

Associate Prof. John J. Gannon of the U-M School of Public Health will direct the investigation and will be aided by state and local health officers, research assistants and U-M graduate students. The first year will be devoted to a survey of lower Michigan to select two rivers for intensive study. Researchers will choose one river which carries domestic organic waste, and another with industrial organic waste.

Prof. C. J. Velz, chairman of the department of environmental health, says work will consist of field studies and laboratory tests. His department has concentrated on river studies for the past ten years to develop knowledge about resources and waste disposal problem. The USPHS grant is an outgrowth of these investigations and is expected to permit the most intensive examination yet undertaken.

Nichols Engineering Moves

Nichols Engineering & Research Corporation announces, effective May 1, 1960, the relocation and consolidation of its New York Executive, Sales and Engineering offices to 80 Pine Street, New York 5, N. Y.

Float controlled magnetic driven pumps mean efficiency for . . .

Automatic Speed Variable Pumping *of Sewage*

by WILBUR R. LEOPOLD,
Worthington Corp.,
Harrison, N. J.

EDITOR'S NOTE: The advantages of float controlled magnetic driven pumps for variable speed pumping of sewage is discussed. The types of controls and the manner in which these controls actuate and cut-out variable speed pumps is also explained and illustrated using actual examples of pump installations. The scheme for decreasing power costs of pump operation gained by high suction head from near full wet wells is of particular interest.

■ FLOAT CONTROLLED variable speed pumping has now assisted in the development of more efficient and economical sewage treatment plants.

Advantages

The use of the magnetic drive and proper float control, through which variable speed is obtained, has considerable effect upon the pump sizing and designs, as well as the cost of the system. It also has these other desirable features:

1. The grit chamber or collecting well can be made twenty-five to thirty-five percent smaller because they can be designed for the average flow instead of the maximum flow. The pump, through the magnetic drive and proper float control, will then pick an intermediate speed that will handle the flow. As the flow increases, the pumps increase their speed to whatever is necessary to handle the flow, or conversely, it decreases in speed to handle the lower flows. Also, the use of constant speed pumps would very likely display a poor power factor because of over-pumping. This would result in poor efficiency resulting from putting extra pumps on or taking them out of service, to handle a varying flow.

2. Over-pumping or under-pumping also usually occurs where wound rotor motors are used, because these speed up or down in very definite steps. No matter how many speed steps, each step is a very definite percentage in speed change. For example: If a 600 rpm wound rotor motor was to slow down one step, there would be about a three percent speed change downward to 582 rpm. This is based upon the regular or normal eleven point control. Now, if the flow was such that only a speed change of 10 rpm, was needed the wound rotor motor would be over-pumping. A magnetic drive, however, could drop to 590 rpm or 596 rpm, or whatever exact speed would be required to hold the predetermined levels. This has quite an effect upon the power curve.

3. More steps of control can be obtained with the wound rotor motor at additional cost. If this is done, the cost fast approaches that for stepless speed change of the magnetic drive. Only a liquid Rheostat can give the wound rotor motor stepless speed change. However, the liquid Rheostat cost alone is very much higher than the magnetic drive, and the additional building structure needed to house this equipment sends its cost too high to be economical, except in those cases where horsepower involved is greater than magnetic drive availability.

4. Constant speed pumps are more efficient than variable speed pumps. Although motor losses in either case are equal, the magnetic drives suffer from a 3 percent slip. Wound rotor motors have approximately the same slip for each speed change. However, when operating on any given speed, the wound rotor motor operates as a constant speed motor.

But, the entire study cannot and should not be judged on pump and motor efficiency. These units comprise only a small part of the sewage plant. With the magnetic drive units, the plant gets a more even feeding, which increases its overall efficiency by quite a margin. The pumps maintain their efficiency longer, and maintenance is greatly reduced.

5. Since the plant is fully automatic, it is safe to assume one man per shift can be eliminated. Based on a salary of about $4,800.00 per year, three (3) times $4,800.00 a year could be the saving on manpower alone. If salaries are higher, the savings would be more.

6. In plants where complete treatment is used, surges to the grit chamber resulting from starting additional constant speed units, are eliminated by the use of variable speed pumps, driven by magnetic drives.

7. Variable speed magnetic driven pumps, with float control and recycling feature, brings all pumps into service at minimum speed, minimum horsepower and minimum capacity. The pump will speed up gradually until output equals inflow. Thus, no power is wasted, peak power demands are held to a minimum, and since there is less stirring up of the sand, gravel and grit, there is very little cutting of the impeller, impeller wearing rings and casing wearings rings.

Without the proper float control, the magnetic drive could not produce these desired operational benefits.

The float control must be sturdy and have a large diameter, heavy float, for ironing out surges in the float tube caused by wet well turbu-

lence. A light float would signal all surges to the magnetic drive and cause it to be continually speeding up and slowing down. The magnetic drive with float control is very sensitive to changes in excitation demands. The float should weigh about 90 pounds; the counter-weight about 45 pounds.

Operation of Float Control

Each float control has a vertical dial indicator geared to the wet well level through a vertical rack. This connects to a spur gear attached to the sprocket chain shaft. The indicator has a vernier target which is very easy to read, even at a distance, and gives accurate reading of the wet well level.

Bulls eye lights, placed on this dial, light at the elevations the specifications designate certain pumps are to start operating. This enables operating personnel to easily see how many pumps are in service, and gives them a clear picture of the entire system operation.

Variable speed operation of pumps depends primarily on the rise and fall of a float riding the surface of the liquid at the suction supply to the pump. A rise in the level causes the mechanism to feed greater excitation to the magnetic drive, and this raises the speed, and in turn the pump output. Conversely, a fall in level causes the exact opposite effects.

There are several types of control, but this discussion will be limited to the two common types of recycling design and the non-recycling design.

Non-Recycling Control

After the sewage level has reached a predetermined elevation in the wet well and pump speed is at a maximum, any greater rise causes over-travel in the control mechanism without changing the excitation supply. Thus the pump speed remains at full value. A certain amount of over-travel is desirable for temporary greater flows as the suction level rises and decreases the net differential pumping head. However, for continued increasing flow a second unit must be started. This is accomplished in the motion of over-travel by contacting a switch through which a second unit is started at full speed, full capacity, and full horsepower. The effect of two pumps at full speed is to over-pump the suction well, whereby the suction well recedes. This effectively decreases the

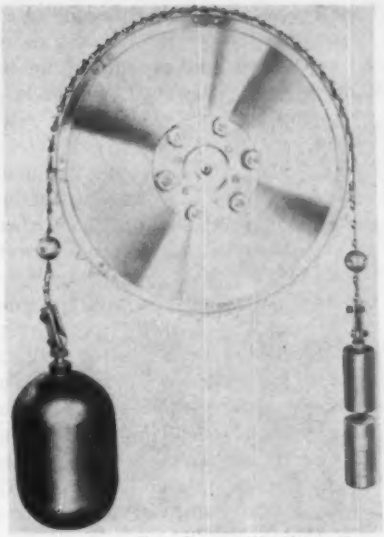


Photo Courtesy Worthington Corp.

FLOAT (left) weighs about 90 lbs. Counter-weight weighs about 45 lbs.

speed of both units evenly to a value where a balanced inflow-outflow condition is attained. Naturally, a given suction level puts the float and mechanism in a definite position, and sets the proper speed of the pump. This level is directly associated with speed regardless of whether one, two or more units are in service. The level of gradient affecting speed therefore repeats as successive units are put into service. A minimum gradient of 4 inches of float travel might cause minimum to maximum speed for a unit, except during over-travel conditions where an additional 6 inches of level may be allowed to start additional units. This additional level becomes one foot when two units are added, 1.5 feet when three are added, etc. Conversely, during receding flows to the station, float under-travels of 6 inches cuts out units in progression. These level rises can be held closer if necessary.

Except for the minor variation of 4 inches in float level and the occasional over and under travel levels, the suction level is maintained substantially constant throughout the range of flow to the station.

This operation is fully automatic. The pumps start automatically at a given level, and additional pumps are started automatically at given levels. Pumps recede in speed, and given pumps are taken out of service at given levels until finally, if the flow becomes low enough, the last pump will automatically drop out of service to wait until a predetermined level is again reached before it will return automatically to service. However, it is seldom that all pumps will shut down because they automatically adjust their pumping capacity. Therefore, at sewage lift stations all sand, grit and trash are held in suspension and pumped out in small quantities before settling.

Recycling Float Control

There are situations where it is desirable to continuously raise sewage levels in the suction well by a considerable amount as successive units come into service. The non-recycling control cannot accomplish this, and in order to effect a definite rise in the suction level with each added pumping unit while using a single operated float and maintaining the variable speed feature, the length of the chain from the float to the mechanism should be shortened. Or, the mechanism could be rephased or recycled to accomplish the same purpose.

Naturally, the most practical way is through rephasing or recycling. The actuating cam controlling the position by which excitation current feeds the magnetic drive can be displaced to a new position from its previously set reference float position. Obviously, if rephased or recycled, so that the start of an additional unit reduced pump speed, the discharge from the pumps is reduced, and the inflow, being greater, allows the level to rise. However, after recycling has occurred, the new higher level is established, and the mechanism still functions to balance inflow and outflow rates.

Pump Excitation

The control with the recycling feature functions automatically when set and ready for operation. When liquid in the wet well reaches a predetermined level, the number one pump starts automatically at its minimum speed, minimum capacity and mimimum horsepower. If the level continues to rise, the float control calls for more speed and horsepower and the pump speeds up, until its output equals the inflow. If the level continues to rise, and one pump cannot handle the flow, this pump is recycled down to minimum speed, the float establishes a new level in the well, and a second pump is brought in service at minimum speed. The two pumps divide the capacity evenly be-

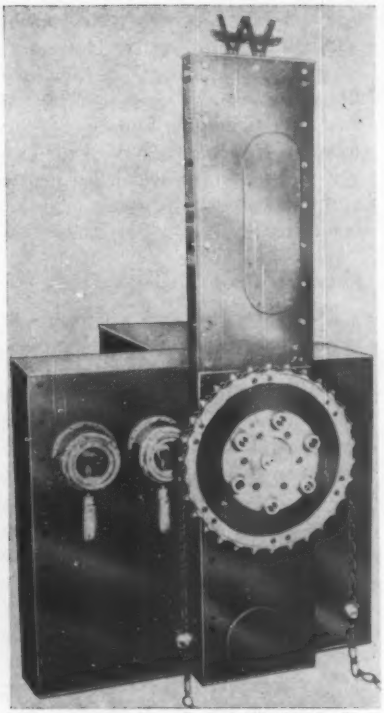


Photo Courtesy Worthington Corp.

REAR VIEW of control showing sprocket turned by rise and fall float in wet well.

tween them, both operating at the same speed. They both increase their speed until they hold the liquid level constant. If these two pumps cannot handle the flow, additional pumps are brought into service in the same way.

The magnetic drive and float controlled pumps maintain a nearly constant liquid level in the wet well. Naturally, to recycle a pump down, causes the speed and capacity to be reduced. For example, suppose one pump is delivering 30 MGD when it reaches its maximum speed and capacity. After recycling down and the second pump is brought into service, each pump would start pumping at the rate of 15 MGD each. Likewise, if these two could not handle the flow when operating at maximum speed and delivering 60 MGD, then after recycling down, a third pump would come on line and the three pumps would divide this 60 MGD. Each will start delivering about 20 MGD at minimum speed and minimum horsepower and then speed up until they find a pumping speed where inflow and outflow were equal.

It has been theoretically stated that the pumps, after recycling down, start pumping at minimum speed. This is not exactly correct, because during the recycling and repositioning of the float, the pumps are operating at reduced speed and capacity while the inflow has not lessened. So, the level in the wet well has actually risen some. The float, at its greater elevation, calls for more than minimum speed and so these pumps start pumping at a speed slightly above their minimum speed, capacity and horsepower.

Also, before recycling and bringing additional units into service, the liquid level is intentionally allowed to rise a predetermined amount to make sure the flow continues to increase to a point where additional pumping capacity is required. This eliminates bringing additional units into service only to take them out of service a few minutes later.

Pump Cut-out

As the level in the wet well falls, the pump speed is reduced. If the inflow continues to decrease after the pumps in service have reached their minimum speed and capacity, they temporarily recycle up to maximum speed, momentarily over-pumping, and while at maximum speed one pump automatically drops out of service.

The reason for this procedure is: two pumps at minimum speed cannot handle as much as three pumps at minimum speed. If one pump is taken out of service at minimum speed, the level in the wet well would rise and the pump just taken out of service would start up again resulting in a surging action, which is undesirable.

After one pump is taken out of service, the remaining units find an operating speed where inflow and outflow are equal. Should the inflow continue to decrease, the same procedure outlined for pump excitation would be followed, until the wet well level dropped to the cut-out elevation when the last pump automatically drops out of service. However, since pumping capacity adjusts to the inflow, it seldom happens that all pumps go out of service at any time. It is this continuity of pumping service that prevents the settling out of any grit in the wet well chamber or interceptors.

When the recycling feature is not used, all pumps are brought into service at their maximum speed as needed, and then they fall back in speed until outflow equals inflow. When minimum speeds are reached, these pumps automatically drop out of service at predetermined levels.

Float Control Installations

Most of the float control installations with the exception of one, were designed to control the flows and pumping rate from the suction bay.

The exception is in the City of St. Louis, Mo. where the pumps in Station No. 1 discharge through a vertical siphon that enables the pump to work on a low head when the river level to which ultimate delivery is made is at low stage. As the river rises, the siphon effect is reduced, and this in turn increases the pumping head. However, the siphons are high enough to prevent any back flow in an idle unit when the river is at maximum stage. Obviously, greater speed is required when the river rises than for low river levels.

At Harrisburg, Pa. the float controls operate on recycling float control except they have an added feature. By snapping a small switch, the entire operating cycle of the control is changed so that if the inflow continues to increase beyond the capacity of one pump, the first pump continues to operate at full speed rather than recycle down; the second pump comes into service at minimum speed and keeps building up speed until inflow and outflow are equal, at which time both pumps are operating at the same speed.

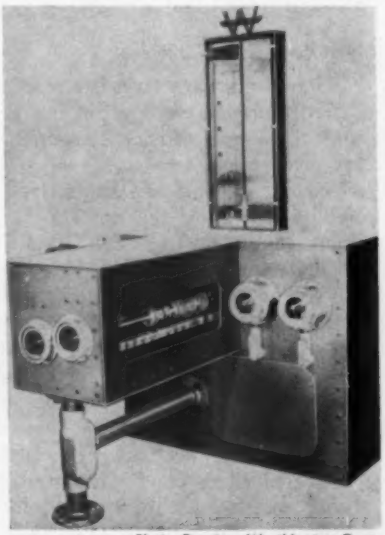


Photo Courtesy Worthington Corp.

FRONT VIEW of control. Vernier scale (top) gives accurate readings of wet well level.

With receding inflow, the last pump brought into service automatically drops out of service when flow reaches a predetermined level.

The standard design is such that the sequence of the pumping units can be changed manually in just two minutes through the use of transfer plugs. This feature permits even operation and wear on all units. Also, if something should happen to a pump or motor, another unit can be plugged into its position, thus maintaining proper elevations in the wet well until the inoperative unit is again ready for service. The indicator bull eyes automatically interchange when the pump sequence is interchanged.

The entire Float Control is housed in an aluminum cubicle with rigid conduit connections and terminal strips, and all switches are fully enclosed metal clad mercury switches for safety against any possible buildup of explosive gases common to sewage pumping stations. All float controls have high and low water alarm pilot circuits wired to the terminal strips, ready for connecting to an alarm. Such an alarm could warn the operator in case of equipment failure or other system trouble.

An entirely new plan and system is being employed by the Allegheny County Sanitary Authority of Pittsburgh, Pa. where the plant is situated on the banks of the Ohio River. The total pumping head ranges from 39 to 106 feet. There are two vertical centrifugal pumps with 800 hp vertical magnetic drives and synchronous motors operating at 400 rpm, and three vertical two speed centrifugal pumps with 1250/450 hp vertical synchronous motors operating at 400/277 rpm. Ultimately another two speed pump and motor will be installed.

The wet well is 40 feet in diameter and 120 feet deep, where the various interceptors from the territory served by this Authority flow into it.

This is a combined storm and sanitary system. The pump room floor is at elevation 616.61 feet. The centerline of the 42 inch siphon loop discharge is at elevation 736.75 feet.

Normal water level in the wet well is at elevation 692.0 feet. The wet well level for 300 MGD storm flow is at elevation 656 feet. The wet well level for the weekly draw down for cleaning purposes is at elevation 622 feet. The invert of the main interceptor is at elevation 618.25 feet. The entire system is designed to maintain a good hydraulic gradient, over the entire range of elevations.

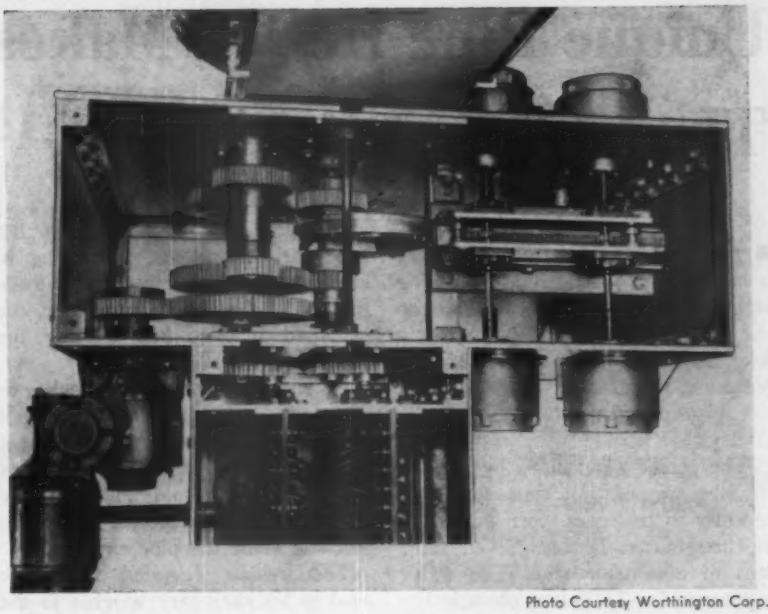


Photo Courtesy Worthington Corp.

INTERIOR OF CONTROL, looking into it from the top. Recycle motor is at bottom left.

During dry weather flow, which prevails 90 to 95 per cent of the time, the float control will maintain a level within plus or minus 6 inches of any chosen level. The operator will keep the wet well level at the greatest heights possible, just sufficient to prevent overflowing at the farthest removed storm water diversion structure and still maintain a hydraulic gradient sufficient to overcome friction losses of the maximum sewage flow.

By doing this, a high head is maintained on the suction of these pumps at practically all times considerably reducing the total pumping head. The wet well is pumped down bi-weekly to a free flow level thus inducing maximum possible velocities which will serve to transport to the wet well, grit which may have settled out in the intercepting sewer system during low flows.

Eleven telemeter stations located at strategic points in the intercepting sewer system transmit to a master panel board located in the control room of the main pumping station, the elevation of the hydraulic gradient (the level of flow) at the respective stations, thus reflecting the condition of flow throughout the system.

Should a rain storm occur in any area served by or in the vicinity of a telemeter station, the hydraulic gradient or level of flow will be immediately transmitted to the master panel board. The pump operator will then proceed to lower the wet well to a predetermined depth thus increasing the slope of the hydraulic gradient and providing the additional head required to overcome friction losses needed to bring in the increased flow due to storm water. After the last of the storm flow has reached the pumping station, the level of the wet well is allowed to rise to the normal operating elevation, thus restoring the system, especially the pumping equipment to maximum operating efficiency.

All pumps come into service or drop out of service automatically except the high speed motors on the two speed units. These are brought into or taken out of service manually.

In most sewage pumping systems, the plants start pumping down the wet well as soon as the minimum wet well level is reached. They do not make use of the suction head they could create with the proper designed wet well which would permit the reduction of total pumping head, thus saving thousands of dollars a year in power alone.

This new system of pumping, making full use of available suction head, float control, and magnetic driven pumps should improve the efficiency of any sewage pumping installation.

Unique Pipe Design Makes Water Flow Through Water

■ THE UNIQUE IDEA of launching a half-mile of plastic pipe, wrapping strips of lead around it and sinking the whole works to the bottom of a lake, saved the residents of Milton, Vermont, thousands of dollars and cut pipeline installation time from 20 days to 8 hours.

The plastic pipe, made by Republic Steel Corporation, was submerged recently to replace a worn out metal pipeline buried beneath seven fathoms of man-made lake. The water represented a 2,900-foot obstacle between eight Milton homes and the town's only water supply.

With the failure of the previous connecting water line, the Milton Water Corporation was faced with the problem of re-installing a pipeline. To avoid the expense of following convention and running metal pipe either around or under the lake, the Milton Water Corporation decided to experiment with the flexible plastic pipe. Inasmuch as the lake is used for boating and swimming in summer and often coated with more than three feet of ice in winter, the proposed pipeline had to hug the lake floor.

As supervisor of the Milton Water Corporation, Kenneth G. Miner put the plastic pipe on trial and spent almost a year developing a system of weights which would hold the pipe below the lake surface yet would not pinch or chafe the pipe exterior.

Test results revealed that wire used to tie stationary weights to the pipe snagged and tended to chafe the plastic pipe as it moved back and forth with the lake currents. To overcome these problems, Mr. Miner strayed from convention. Using three-inch-wide, one-eighth-inch-thick lead sheeting strips and spacing them between eight and twelve feet apart, the pipe was kept submerged. Moreover, the pipe could not be chafed since the lead strips wrapped around its exterior were, in effect, part of the pipe itself and would sway with the pipe.

To install rigid metal pipe in the lake a system of pontoons would be needed along with special fittings to support the pipe in place. In all, this type of installation was estimated at around $4.00 per foot installed. With plastic pipe and the new installation method, the job cost about $.40 per foot, according to Mr. Miner.

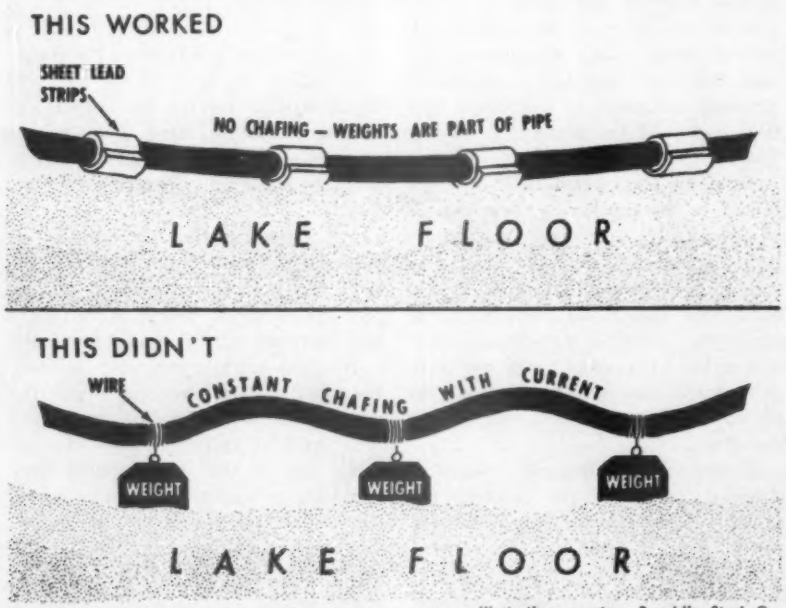
To install the pipe, a crew of six was required. Lengths of one-and-one-half-inch flexible plastic pipe were joined by metal couplings and clamps. Then the snake-like 3500 foot-long line was laid along the shore in loops, ribbon candy fashion. Both ends of the line were sealed with plugs and the pipeline "to be" was set afloat on the water.

Being lightweight and airtight, the pipe floated on the lake surface and was easily towed into position. Workmen connected one end of the pipe to a line leading to a pump station and towed the other end to the opposite shore and connected it to the house service lines, already installed five feet below the ground.

The pipe was then filled with water. It sank—but only to a level just below the surface. From a boat the crew then inched along the pipeline wrapping the lead strips once around the pipe at the specified intervals.

At the end of one eight-hour day, the job was complete and the new water line rested 40 feet below the surface—following the contour of the lake bottom. At the end of a week, the pipe had become embedded in mud and plant life and was completely covered. To install rigid metal pipe would have meant a month's work, according to the Milton Water Corporation.

Water pressure is 86 pounds along the line and is contained by Republic Steel's 100 pound FE pipe. Made of polyethylene, the pipe is completely inert to the chlorinated water it conveys and will not corrode or allow formation of scale.



Illustrations courtesy Republic Steel Co.

TESTS WITH the flexible plastic pipe revealed that wire used to tie stationary weights to the pipe (lower drawing) snagged and tended to chafe the plastic pipe as it moved back and forth with the lake currents. With the use of lead sheeting strips along the length of the pipe (top drawing), chafing and snagging were eliminated.

Application of Instrumentation Principles on an . . .

Investigation of Liquid-Alum Flow Measurement

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& RUSSELL H. BABCOCK, Mgr.
Water and Waste Division
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Foxboro, Massachusetts

RESUME: Close control of alum feed is often required in coagulation of critical water supplies. A wide range pneumatic system offering automatic control and remote recording of liquid-alum is described.

■ THE USE of liquid alum as a coagulant in water supply has become widespread over the last few years ease of handling. These are facts because of its availability, cost, and which make its use economically desirable. The Salem and Beverly Water Supply Board, recognizing these facts, made an installation for feeding liquid alum in January, 1955.

During extensive work done with both pH and conductivity difference, we became more acutely aware of some of the mechanism of coagulation with alum. During the winter months in particular, we were able to produce good water with less alum by achieving close control of the alum dose, coupled with the fact that the alum was in solution before being applied. Table 1 shows these data.

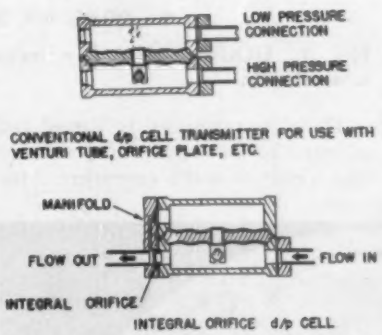

FIG. 1. SKETCHES SHOWING DIFFERENCES between conventional differential pressure cell and integral orifice differential cell used in liquid-alum study.

variety than the two types previously utilized. Because of this fact, it was decided to investigate the possibilities of the actual flow measurement of liquid alum on a volumetric basis. The success of such a measurement would make the rationing of liquid alum to plant flow a simple matter.

Table 1 Comparison of Quantities of Dry Alum & Liquid Alum Required for Coagulation

	Alum consumption (lb per mil gal) Jan., Feb., and March		Year
Dry Alum	1952	304	235
	1953	276	217
	1954	305	242
Liquid Alum	1955	251	206
	1956	180	170
	1957	181	188
	1958	189	182

The raw water at this installation is rather uniform in its characteristics, and while some type of control was necessary for the feeding of the alum, we felt it could be of a simpler

An Integral Orifice d/p Cell Transmitter, manufactured by the Foxboro Company, was installed to measure alum-syrup flow. Our previous installations had not included any measuring device on the alum flow, except for a short period when a plain rotameter was used for some calibration studies.

To be really useful, any measuring device should be capable of easily transmitting the reading to any desired point in the plant and of using this same reading to control the feed of alum. The Integral Orifice d/p Cell Transmitter described in this paper has these characteristics. This device is, essentially, a conventional force-balance pneumatic transmitter, except that pressure taps are not taken off the conventional primary device. Instead, a small orifice is installed as part of the transmitter. The flow then passes directly through the transmitter, the differential pressure being measured and turned into a pneumatic signal in the conventional manner (Fig. 1).

Since orifices are available for this device from ¼" in size down to 0.020" in diameter, a wide range of liquid-alum flows can be handled with the device. Also, the transmitter is capable of adjustment from a full range of 20" to 250" of water. For example, the transmitter presently in service is equipped with an orifice with a bore of 0.0995 inch. Maximum range is 250 gal per day or 0.15 gal per min. The integral Orifice d/p Cell Trans-

mitter is capable of measuring accurately 25% of this value. A lower flow range could be achieved by merely substituting a smaller orifice, or vice versa.

In our studies at Salem and Beverly we have used a standard receiver with a chart graduated from 0-100 and devised calibration curves for different orifices and differential ranges. This method allows for the broadest use of the equipment.

So far, we have used the device only for measuring the alum flow. Control has been achieved by the pH instrument, the conductivity instrument, or manually. We have been particularly concerned with determining whether or not the instrument would have a tendency to plug or develop coatings or deposits which would impair its operation. During six months operation there has been no evidence of plugging, and the measurement has been stable. This is in contrast to the reported experience at Chicago, where difficulty was experienced with plugging of transmitting rotameters. With a straight indicating rotameter, used over a two-month period, we experienced no difficulty.

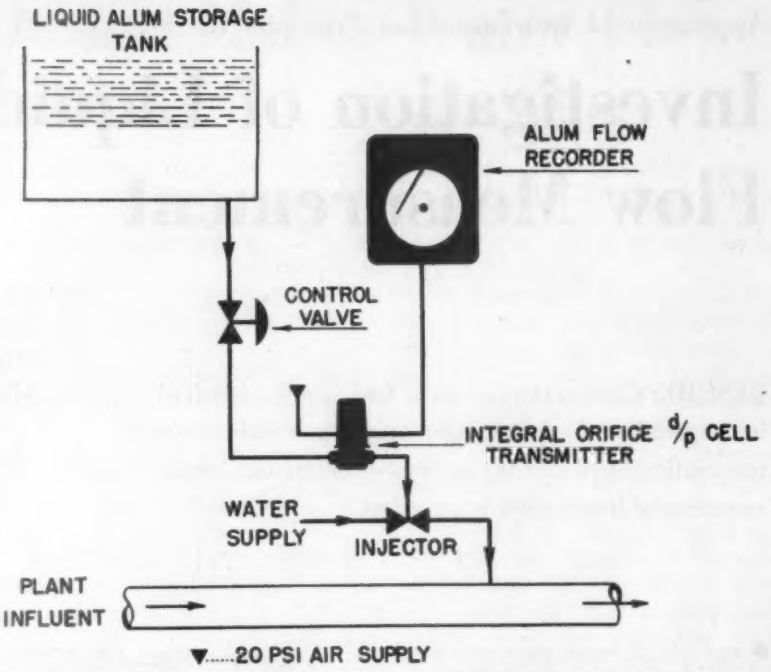

FIG. 2. LIQUID ALUM flow measurement at Salem-Beverly is illustrated schematically.

The alum purchased is filtered and adjusted by the supplier to a uniform Al_2O_3 content of 8% (commercial paper-making grade). The supplier's truckman pumps it directly to a lead-lined storage tank, from which it is fed by gravity without dilution. This fact may account for the lack of difficulty in our equipment.

In three years of operation, only one plugging has occurred in the portion of the equipment handling undiluted alum. On this one occasion a piece of foreign matter plugged the small opening in the pneumatic valve.

In contrast, the portion of the system where the alum is diluted for addition to the raw water requires periodic cleaning, starting with the injector itself, where the alum and water first meet. This cleaning, however, is only necessary about four or five times a year.

In the control of liquid alum through a small valve, it seems to be necessary to use some method which will keep the valve "alive." This factor eliminates the use of a simple control method, where the valve position is set directly from the ratio of flow of water through the plant. In this case, small accumulations of sediment might gather in the valve, thus reducing the alum feed. Also, it gives the valve stem a chance to stick in the packing.

Whether pH, conductivity difference, or a ratio controller between alum flow and water flow is used,

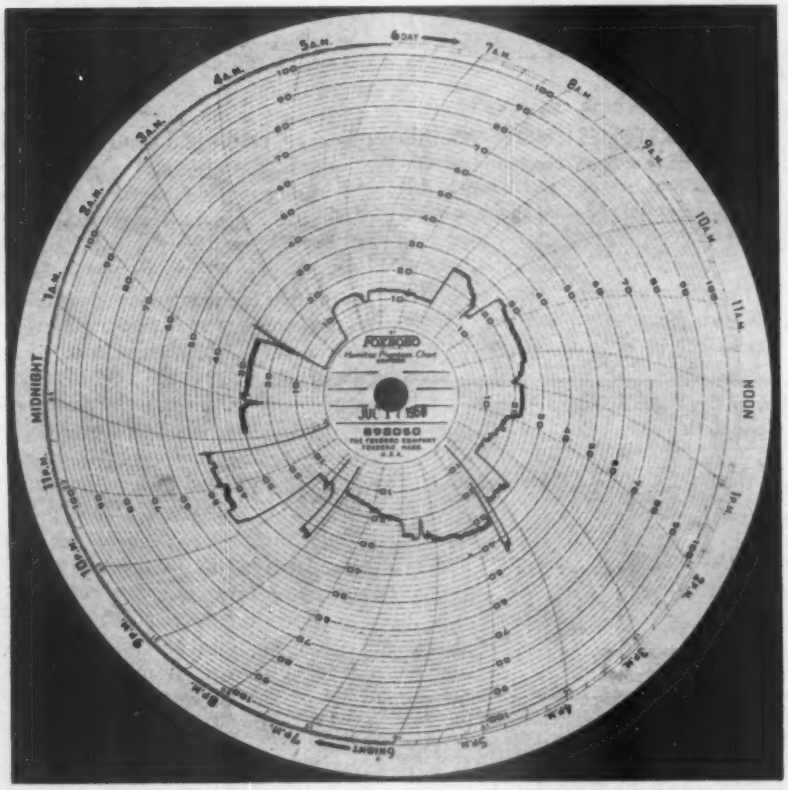

FIG. 3. MANUAL CONTROL provides chart record shown here. Note changes in feed rate.

any irregularity in the flow of the alum will move the valve. Small deposits in the valve are, therefore, automatically flushed through. If the valve stem should tend to stick, the air pressure would gradually build up until the stem was freed. With a flow recorder on the alum feed, valve restriction or sticking beyond a minor amount can be quickly spotted by the operator.

In the case of the installation at Salem and Beverly, the liquid alum is held in a lead-lined wooden tank with a capacity of 5,000 gal. It passes by gravity from the tank, through a pneumatic control valve, and then through the Integral Orifice d/p Cell Transmitter. The flow is then sent into the suction side of the injector and delivered to the raw-water line at the point where it enters the plant. The alum is undiluted at the point of measurement. The pneumatic control valve has been used with both pH and conductivity-difference controllers and could be used with either a flow-ratio or flow controller.

Fig. 2 illustrates the physical arrangement of the alum tank and Integral Orifice d/p Cell Transmitter and injector within the plant installation. The pneumatic receiver is located in the Superintendent's office.

Fig. 3 is a typical recorder chart when using manual control. Various alum feed rates are shown, as well as a condition where the valve was slowly plugging, due to stirred-up sediment in the storage tank. Automatic control could relieve the plugging and maintain a constant or a proportional-to-water-flow feed rate.

Fig. 4 is an illustration of the Integral Orifice d/p Cell Transmitter, control valve and injector arrangement. It should be noted that the liquid alum enters one side of the Transmitter and passes directly through and out the other side of the Transmitter.

Calibration

At Salem and Beverly the Transmitter was calibrated by measuring the time for a given volume to flow. To obtain more information on the range over which this device is used, a calibration program was undertaken in the laboratories of The Foxboro Co. Fig. 5 illustrates the arrangement of the equipment for this work. It consists, essentially, of a source of liquid alum under a constant head with a manually adjusted valve downstream of the Integral Orifice d/p Cell Transmitter. The temperature was controlled within one degree, to minimize the effects of viscosity and changing density.

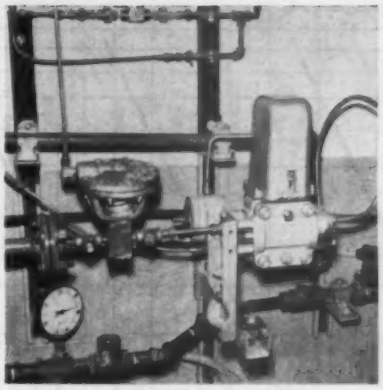

FIG. 4. INSTALLATION OF integral orifice differential pressure cell transmitter, control valve and injector.

Fig. 6 illustrates the calibration curves which were derived from that work. In this figure curves for water and for liquid alum at 80° and 100°F. are shown. It will be noticed that there are no calibration curves for the smallest and largest orifices. In the case of the smallest orifice, the flow was so small that it fell outside the range of practical liquid-alum use. In the case of the largest orifice, the reverse was true, due to our limited supply of alum. In the case of the largest orifice, however, there is no question that it would function satisfactorily and behave similarly to the other calibration curves.

Automatic flow control is comparable in its functions to a liquid feeder or metering pump. It provides the additional advantages of flow transmission, recording and a convenient means of changing the feed rate.

This investigation of the flow of liquid alum—and more particularly, the application of the Integral Orifice d/p Cell Transmitter to this measurement—has shown this type of device to be capable of great flexibility due

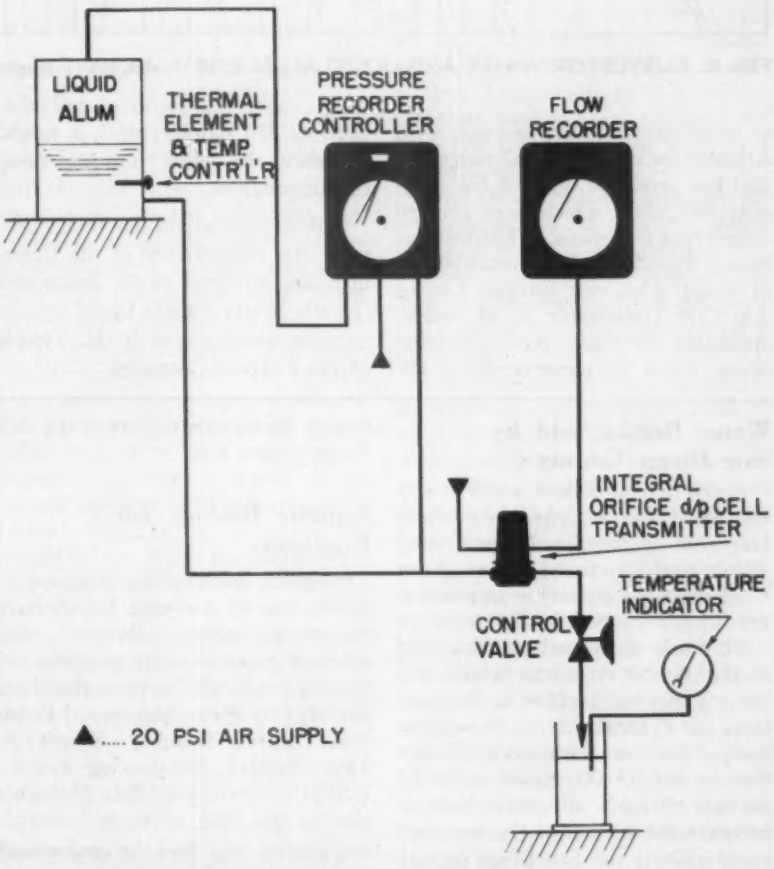

FIG. 5. TEST ARRANGEMENT for integral orifice differential pressure cell transmitter, calibration shown schematically.

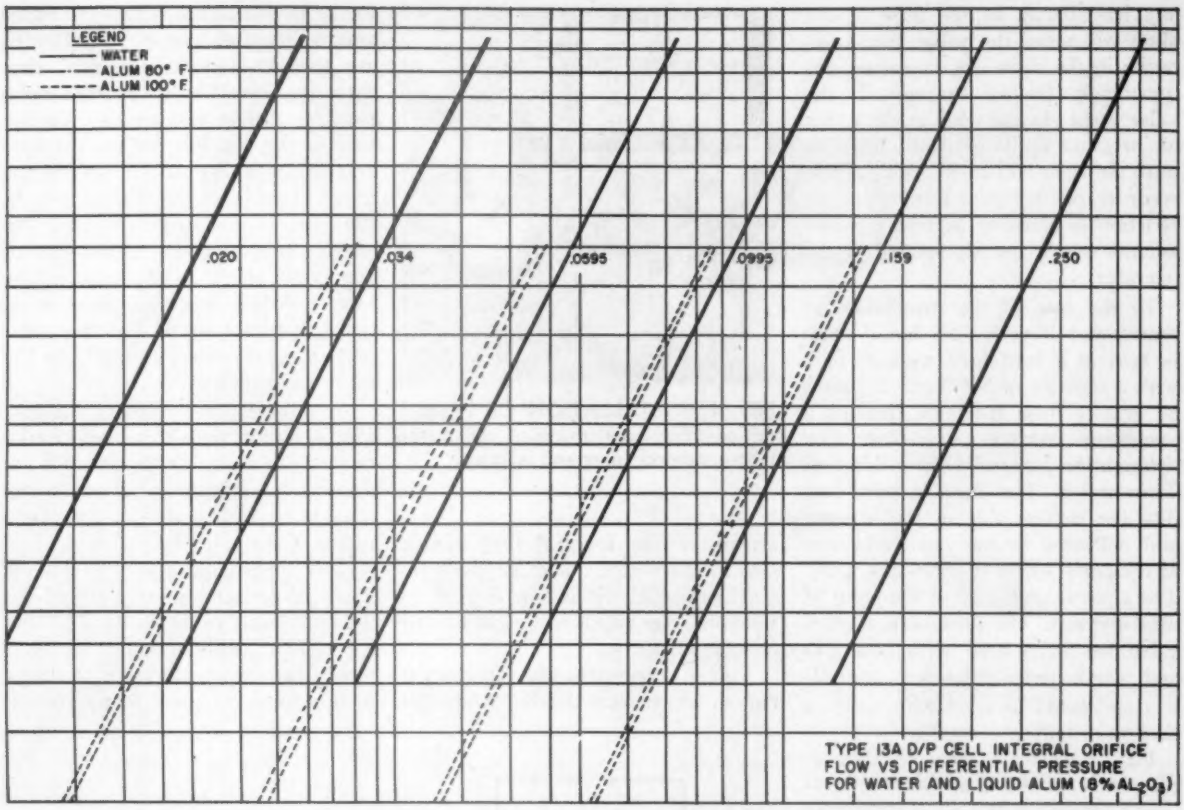

FIG. 6. CURVES FOR WATER AND LIQUID ALUM at 80°F and 100°F illustrate orifice sizes to obatin calibrated flows.

to interchangeable orifices and wide adjustments of differential ranges. It also has produced none of the plugging difficulties which have plagued other types of devices. While this has been a discussion of the measurement of liquid alum, the Integral Orifice d/p Cell Transmitter is, of course, applicable to many other chemical flows. Since its construction is entirely of 316 stainless steel, it would, therefore, be ideal for measuring caustic solutions.

The authors would like to acknowledge the co-operation of the Chairman and Members of the Salem and Beverly Water Supply Board and the valuable assistance of R. K. Temple of The Foxboro Company.

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Water Bonds Sold by San Diego County

Seven million dollars worth of second San Diego Aqueduct bonds have been sold by the San Diego County Water Authority to the Halsey Stuart Company last February at an effective net interest cost of 3.8393 per cent.

This sale completed the financing of the second Aqueduct which will bring additional supplies to the area from the Colorado River. It was estimated by the Authority's officials that the $30,000,000 raised so far by the sale of bonds will enable them to complete the section of the aqueduct being built by the San Diego organization. The Metropolitan Water District has undertaken to build the section of the aqueduct north of the San Diego County line.

Aquatic Biology for Engineers

"Aquatic Biology for Engineers", is the title of a course for sanitary engineers, sanitary chemists, and others engaged in water pollution and control work, will be presented June 20-July 1 by Water Supply and Pollution Control Training, Robert A. Taft Sanitary Engineering Center, USPHS, Cincinnati, Ohio. Biologists new to the field of water pollution and control may find the course useful for orientation.

Fundamentals of the application of biology to analysis of water pollution problems will be stressed. Laboratory work will feature techniques for handling and identifying aquatic organisms and interpreting their significance. Evaluation of toxic wastes by fish bioassays, and practice in field collections, will be on the agenda.

Among subjects for lectures and exercises will be biological indications of organic enrichment, aquatic life associated with pollution, results of organic enrichment on stream fauna, marine and estuarine effects of pollution, treatment of wastes (stabilization ponds, anaerobic, and other methods), problems of industrial pollution, and water quality management and criteria.

Experience at the Westchester County New York plant is the basis for . . .

Vacuum Filtration of Digested Sludge

by JAMES M. BROWN, Supt.
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Westchester County DPW
New Rochelle, N. Y.

EDITOR'S NOTE: Few phases of sewage treatment command a degree of interest comparable to that of sludge handling. This situation is in all probability an outgrowth of the fact, so well put by Mr. Brown the author of this article that "the handling of sludge is still one of the most complex problems facing the sewage plant operator." This situation puts a premium on the interchange of operating results so that the profession in general may profit from the experience gained at each plant. Information of this type is presented in this paper which details the results of several years of operating experience and study. Of particular interest is cost data which shows separately the cost of filtration and incineration. Also quite interesting is the method used to correct a build up of calcium in the filter media which was reducing operating efficiency.

■ TRITE, BUT TRUE is the statement that the handling of sludge is still one of the most complex problems facing the sewage treatment plant operator. Whether it involves the pumping of fresh sewage solids, the digestion of the sludge or the dewatering of the digested solids, the problem involved in the handling of sewage sludge is always present.

The purpose of this paper is to discuss the dewatering of digested sludge at the New Rochelle District sewage treatment plant and to discuss the variables affecting the filtering rate of digested sludge. It employs primary treatment for the wastes from the New Rochelle Sewer District which includes the city of New Rochelle and the Villages of Larchmont and Pelham Manor prior to discharge into an outfall extending 9900 ft into the deep water of Long Island Sound.

Even though vacuum filtration of sludge from chemcial precipitation plants was well established before the turn of the century in this country as well as in England, it was not until the middle thirties that vacuum filtration of digested solids was considered to be an established and reliable process to compete with other methods of sludge dewatering. In the early thirties installations were built at Milwaukee, Chicago, Columbus, Baltimore and Winston Salem to name a few of the more important plants. The impetus of vacuum filtration was mainly because of the ever increasing popularity of the activated sludge process which resulted in an increased amount of sludge and because of the reduction in costs of conditioning chemicals, principally ferric chloride. The filters used to filter sewage sludge were those taken from industry which had been used to dewater industrial slurries. It was not until shortly after the second World War that vacuum filters were built which were designed especially for the sewage works field.

Equipment

The vacuum filter employed at the New Rochelle District plant is an 8 ft x 8 ft coil spring filter utilizing a surface area of 200 sq ft. In 1958, the solid content of the cake averaged 28.4 percent while a filtering rate of 6.5 lbs per sq ft per hour was obtained while during the first nine months of 1959 an average solid content of 28.8 percent and a filtering rate of 7.1 lbs per sq ft was maintained.

Conventional rate sludge digestion is practiced at the New Rochelle plant with present digester loadings accounting for a detention time of over 40 days. Each of the four digesters are equipped with three draft tube mixers. The mixers in the primary tanks are used to break up scum and keep the contents of the tank in a homogenous state.

With the exception of scum around the periphery of the tank the surface of the digesters are maintained free of scum. The mixers are operated one hour in a reverse direction and three hours in a forward position three times a day.

The mixers in the secondary tanks are not used, since the secondary tanks serve to concentrate the digested sludge and produce a supernatant of good quality which can be returned to the plant without detrimental effects on plant operation. Digested sludge from the secondary digesters is pumped with a solid content of 8 - 12 percent to the vacuum filters by a duplex plunger pump. At times when the sludge is heavy it is difficult to pump it to the filter without the addition of water. Although the practice of adding water to sludge is not to be desired there are times when it becomes necessary in order to draw the sludge through the long suction line.

The surface elevation of the digester contents is a critical factor in the

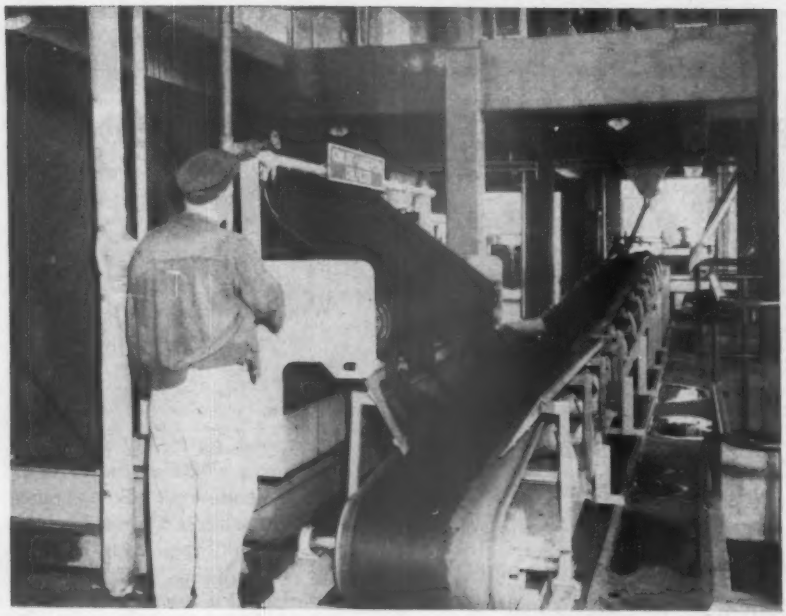

FIG. 1 VACUUM FILTRATION equipment at the Westchester County plant in operation.

efficient operation of the mixers. Too high a level will decrease the zone of influence while too low a level seriously reduces the capacity of the mixer. A submergence of 5-7 in. over the baffles seems to produce the best skimming action.

Anhydrous ferric chloride is mixed in rubber lined tanks and a 10 percent solution of ferric chloride fed to the mixing tank along with high calcium hydrated lime. The amount of ferric chloride required has averaged 3.0 percent on a dry solid basis while the lime expressed as calcium oxide amounted to 7.4 percent. Laboratory experiments have repeatedly shown that less lime is required when a high calcium content lime is used compared with the amount needed when dolomitic lime is used. For this reason it appears more logical to express dosages of lime in percent of calcium oxide rather than simply in percent of lime. The filter cake having a solid content from 28 to 30 percent is carried by means of a belt conveyor either to a flash dryer where the cake is incinerated or taken outside the building where it is stockpiled. Although the incinerator was originally designed for incineration of the solids, the flash dried solids can be withdrawn by improvised means from the dryer prior to incineration and the material bagged for use as a soil conditioner. Several tons of the material have been used on County owned golf courses and other quantities have been given to home owners for evaluation. The installation of storage and facilities to allow more efficient bagging of the dried sludge and to permit its sale on a commercial basis is being studied. However, at least for the present, it has proven to be economical to stockpile the filter cake near the filter building for removal by nurseries, village park departments and other interested people.

Filter Performance

The basic criteria for judging filter performance are: *Yield*—Amount of cake produced expressed usually in pounds of dry solids per sq ft of filter area, *Moisture*—This is of special importance when the cake is to be incinerated or dried since the work done by the incinerator is dependent upon the pounds of water evaporated, *Cost*—Expressed usually in cost per ton of dry solids, and *Quality of the filtrate.*

Filter yield depends on many things but chiefly on the characteristics of the sludge including the size and shape of sludge particles, the solid content of the sludge, the physical and chemical treatment of the sludge, the vacuum applied, speed of the drum, and on other mechanical features of the equipment design.

The size, shape and density of the solid particles have a profound effect on filterability. It has been shown that the smallest particles in sludge exercise the greatest coagulating chemical demand per unit weight of solids. Garber[2] found that the particle size of elutriated sludge was greater after thermophilic digestion than after mesophilic thereby requiring a lower chemical dosage. Digestion at the higher temperature at the Hyperion plant resulted in a three fold increase in filter yield with a 50 percent reduction in coagulant demand[2]. During the digestion process the size and shape of the sludge particles are greatly changed. The particles size is reduced and fibrous material is broken down in a homogenous mixture having a smaller particle size. Digested sludge therefore is more difficult to filter than raw sludge. Many cities have reported rates for filtering raw sludge as high as 10-12 lbs of dry solids per sq ft per hour.

The fact that an increase in concentration of the sludge produces an increase in filter rates has been well known. The increase in rate with sludge concentration is understandable when one realizes that with more concentrated sludges less filtrate volume has to be removed per lb of filter cake deposited. Secondary digesters at the New Rochelle plant allow quiescent settling of the digested sludge and allow the release of gases adhering to the solids. Consequently it is quite common to withdraw sludge to the filter with a solid content of over 10 percent. Experience has shown that the thickness of the cake depends a great deal on the concentration of solids in the sludge. The thicker filter cakes result from a more concentrated sludge while the thinner cakes result from thin sludge.

Sludge Conditioning

Sludge conditioning consists mainly of the addition of chemicals which coagulate or clump the sludge solids in order to produce a filterable slurry. The coagulation of the solids allow the water to drain from the body of the sludge and permits it to be dewatered. Many chemicals have been tried especially iron and aluminum salts, but in most cases ferric chloride and lime seem to be the best. In some cases where waste solutions of iron or aluminum salts and lime slurries are available from nearby industries they have been used to advantage.

Genter has prepared a useful table to show that coagulant demand de-

pends on bicarbonate alkalinity and the ratio of volatile and mineral material indicating that the greater the alkalinity the greater the chemical demand[3]. The anaerobic digestion of sewage solids is accompanied by the production of end products such as ammonium bicarbonate which increases the coagulate demand of the sludge. However, the digestion process also alters the ratio of organic matter and mineral matter thereby reducing the chemical requirements. The sum of these two factors computed by Genter is shown in his table which compares favorably with our chemical requirements. The elutriation of digested sludge reduces the coagulant demand of sludge by washing out the waste products of digestion which otherwise would exert a chemical demand.

The alkalinity of digested sludge normally ranges between 3000-4000 mg/l, although the digesters at New Rochelle have operated satisfactorily at alkalinities between 1500-1800 mg /l. The reason for such low alkalinities is attributed to the fact that in 1958 the amount of sludge pumped to the digesters amounted to 2700 gals per million gals of sewage treated which produced a sludge having an average solid content of 2.6 percent. Excess water in the sludge tends to elutriate it thereby reducing its alkalinity. Difficulty with bridging of the sludge in the hoppers of the settling tanks makes it difficult to obtain sludge with a high solid content. Recently, the use of an air sparger to break the bridged sludge has allowed an increase in sludge concentration to 4 percent which in turn has increased the pH to 6.9 and the alkalinity to over 2200 mg/l.

The mixing of the chemicals with the sludge is a very important factor in the conditioning of sludge prior to filtration. We have found at New Rochelle that for maximum filter production the ferric chloride must be introduced first, followed by the addition of lime. The conditioned sludge deteriorates very rapidly upon standing and should be filtered as soon as adequate mixing is accomplished. In fact, samples of conditioned sludge taken from the filter vat changes in filterability so rapidly that samples could not be taken to the laboratory for study unless they could be tested almost immediately. Samples showed a serious increase in the specific resistance value upon standing for 15 minutes indicating that the material became more resistant to filtration. Thus, increased time between dosing and filtration result in lower rates and therefore lower filter capacity. After chemicals have been added and mixed with sludge the conditioned sludge should be discharged to the filter vat directly. In fact we have found that a higher filter rate is obtained at times by not operating the mixer in the mixing tank but relying on the movement of the sludge to obtain adequate mixing.

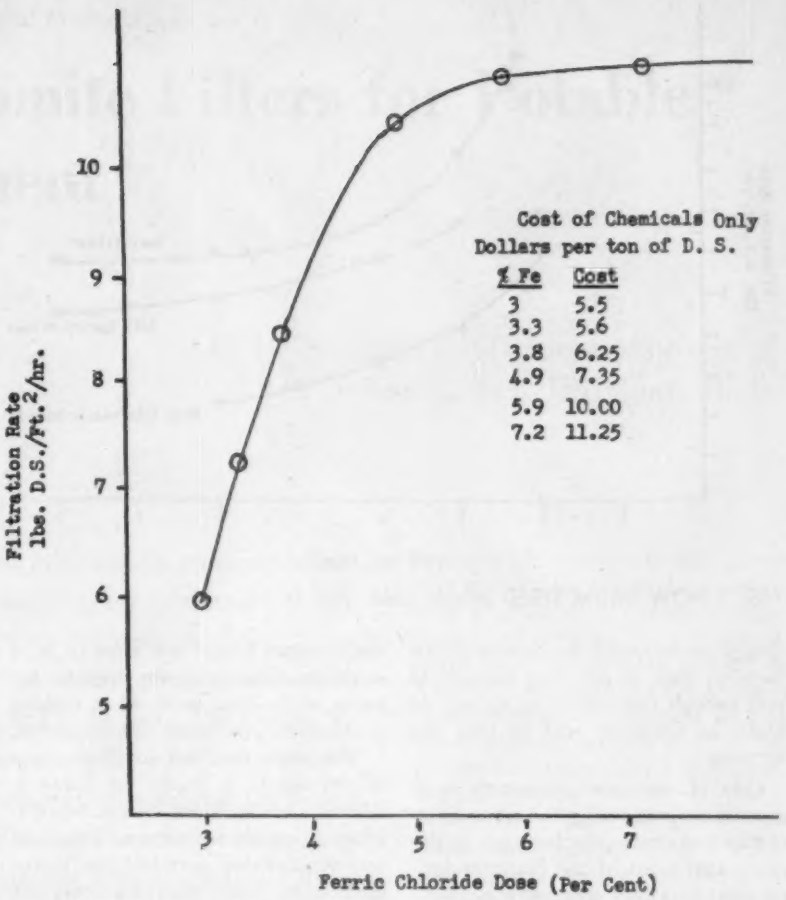

FIG. 2 THE EFFECT of ferric chloride dosages on the filtration rate.

Overdosing with ferric chloride while it is an uneconomical practice shows no evidence from our laboratory experience or from actual filter operation that it retards the filtration rate. The curve in Fig 1 shows that there is a very definite point where the addition of more ferric chloride is not worthwhile since it increases the cost per ton. It has been demonstrated that proper sludge conditioning is also essential for minimizing the moisture content of the cake.

Other Factors

Other factors which affect the filter yield are speed of the drum and submergence. Fig 2 is a typical curve illustrating the effect of drum speed on filter yield. The lower curve is that reported by Schepman and Cornell[4] while the middle solid line is a typical curve on New Rochelle digested sludge using the coil spring filter. The top curve is a laboratory curve using a small leaf filter. In practice, there is a point where additional speed of the drum has a detrimental effect on filter rate. This point apparently depends on the solid concentration of the sludge since if the

Table I

Cost of Filtering One Ton of Dry Solids

Ferric chloride	60 lbs.	$ 5.22
Lime	204 lbs.	2.24
Water	300 cu ft	0.54
Power	90 Kwhrs	1.80
Labor	2.6 hrs.	5.86
Total		$15.66 per Ton

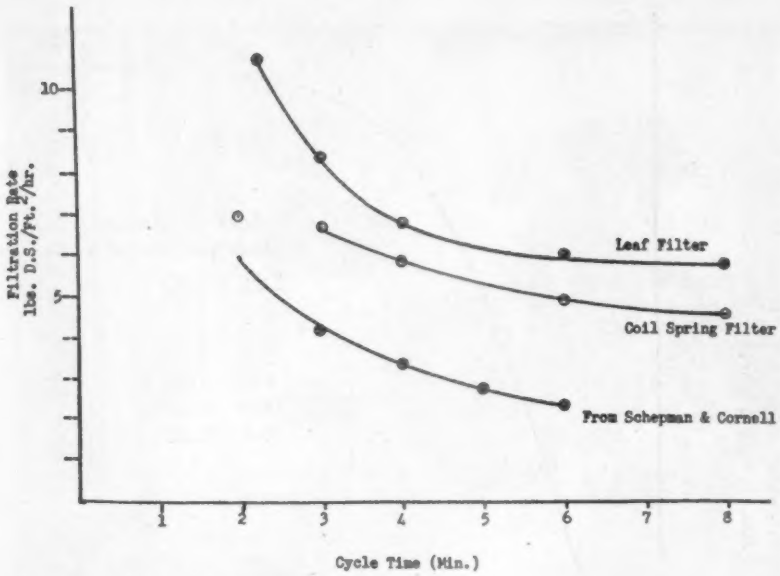

FIG. 3 HOW DRUM SPEED effects yield.

sludge is not heavy the decreased immersion time is not long enough to pull enough cake onto the springs to make an adequate seal to hold the vacuum.

One of the most commonly used methods of measuring the filterability of digested sludge has been one of the many variations of the Buchner funnel test. However, this test is not sensitive to small changes in filterability and is difficult to translate to plant performance. Coakley has introduced a test applicable for sewage sludge and used by others for determining the filterability of industrial slurries which is known as specific resistance[5]. In this test, a type of Buchner funnel is used where the filtrate can be collected and measured with respect to time. A plot is made of the volume and the time divided by the volume resulting in a straight line whose slope varies with the filterability of the sludge. Although the application of this test is exceedingly useful to those interested in research studies the leaf filter test or the simple Buchner funnel test seem to be of more practical use to the operator because of the time involved in making a specified resistance determination.

The costs involved to filter a ton of dry solids is shown in Table 1. All costs are included except depreciation of capital equipment. This item was not included since last year's production of filter cake was only 35 percent of the design capacity of the unit.

The additional costs involved to incinerate the filter cake would amount to $12.98 per ton[7] and is distributed as shown in Table 2.

After two years of filter operation and about 35 hours of operation per week the coil springs of the filter appeared to stretch causing them to sag and did not allow them to tightly cover the filter drum. It was found that this stretching of the springs was due to calcium deposit building up in the interstices of the coil spring filter media due to the use of lime. This also has been found to be a common occurrence in cloth filter media causing a blinding of the cloth. We were advised of a procedure found by the manufacturer to relieve the condition which consisted of washing the springs in a bath of acid. The procedure is a simple one where an acid solution called Oakite Sol. No. 32 is dumped into the filter vat and the springs are rotated in the bath until carbonate scale has been neutralized. The filter is then washed carefully and the springs are restored to their original shape. This has been done twice in the last four years.

There is in the literature a considerable amount of information on the effect of vacuum on filtration rate, notably that done by Coakley, Dahlstrom, Schepmann, Cornell and Trubnick. Much of this information is in disagreement as far as the conclusions that are reached. Laboratory tests conducted at our plant at various vacuums ranging from 10-20 in. of Hg indicate that at the lower vacuum the yield is 88 percent of the yield at the higher vacuum. Coackley & Jones[6] have used a term which is the gradient of the graph obtained by plotting log (specific resistance) vs. log (pressure). The slope of the curve using New Rochelle digested sludge ranged from 0.9 to 1.19. Coackley & Jones published a graph showing the theoretical yield for various values of s for different vacuums. No explanation can be given for the values over unity except that our primary digested sludge has a high degree of compressibility. The greater the slope, the greater the compressibility and less is the effect vacuum has on yield. At least, with a sludge similiar to ours vacuum does not materially effect the filtration rate.

Although great advancement has been made in equipment design in the past decade in the dewatering of sewage solids more work is needed to determine more effective coagulating agents which will permit a reduction in costs of filtering. Unless these methods can be found it appears that other methods of sludge disposal may find their place in the sewage and industrial wastes fields. The use of coagulating aids and some of the other polymers recently being marketed may be one method of reducing filtering costs.

Table 2

Cost of Incinerating One Ton of Dry Solids

Power	152 Kwhrs	$ 3.04
Water	350 cu ft	0.63
Settled Sewage	200 cu ft	0.10
Aux. Heat (2060 Btu per lb. of solids)	27.5 gal of No. 2 oil	3.36
Labor	2.6 hrs	5.85
		$12.98 per Ton

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A new development worthy of careful evaluation is . . .

Vacuum Diatomite Filters for Potable Water Treatment

by H. N. ARMBRUST, Project Engineer,
B-I-F Industries, Inc., Providence, R. I.

EDITOR'S NOTE: As a means of avoiding the problems of the pressure diatomite filters while retaining the advantages of this method of filtration the vacuum filter has been developed. This type of equipment has been used on several potable water problems where special requirements had to be met. The results obtained from these applications has, to say the least, been interesting. The vacuum diatomite filter consists of an open tank containing either leaf or tubular type filter elements which are connected to a clear water manifold. Where sufficient head is available filters of this type can be operated by gravity but the more common method is to connect the clear water manifold to the suction of a pump. Among the special advantages of this approach to diatomite filtration are simplicity and economy of construction, better cleaning of filter elements, better control of precoat, and the availability of the filter elements for inspection at all times during the filtration cycle. This paper which was originally presented before the fall meeting of the New England Water Works Association is published here with their permission.

■ DURING THE PAST several years the use of the diatomite filter in swimming pool water purification has increased phenomenally. In 1958 approximately 10,000 municipal and institutional pools were built and 53 percent of these employed this method of filtration.

While it is true that the problems in pool filtration are different from those in potable water filtration, the desired result is the same. Consequently the operating experience of these installations warrants scrutiny by the water works industry.

A number of installations have been made in the past few years on potable and industrial water supplies where a higher degree of impurity removal has been required than is commonly encountered in municipal water treatment. In these cases diatomite filters have worked out to very good advantage.

For the water supply on Operation Deep Freeze, the recent expedition to the Antarctic, nine small filter plants were used for the treatment of melted snow to remove soot from oil fired heaters and penguin guano pollution. Three more plants were shipped in August of this year. As the problem of water supply in a location such as this is quite critical, it is obvious that the equipment had to be both dependable and efficient.

Recently a paper company found that it was necessary to use a higher quality water for the manufacture of photographic paper than could be produced by its new sand filtration plant. Not only did the water have to be of high clarity, but it also had to be free of radio active particles. Tests using a gravity-vacuum diatomite filter showed that a completely satisfactory water could be produced and a full scale plant will shortly be installed. The raw water is a highly turbid one obtained from a river at a point below another large paper mill which discharges sufficient waste to cause the river to appear like grayish milk. Treatment ahead of the filter consists of coagulation, pH correction with aluminum sulphate and sodium hydroxide, chlorination, and sedimentation.

At Messina, N. Y. a gravity vacuum diatomite filter plant is supplying the potable water for the new Reynolds Metals plant. According to a recent report from Reynolds, the operation of the equipment has been very satisfactory and has met with complete approval from the New York State Health Department. The water is pumped from the St. Lawrence River directly to the filters without pre-treatment.

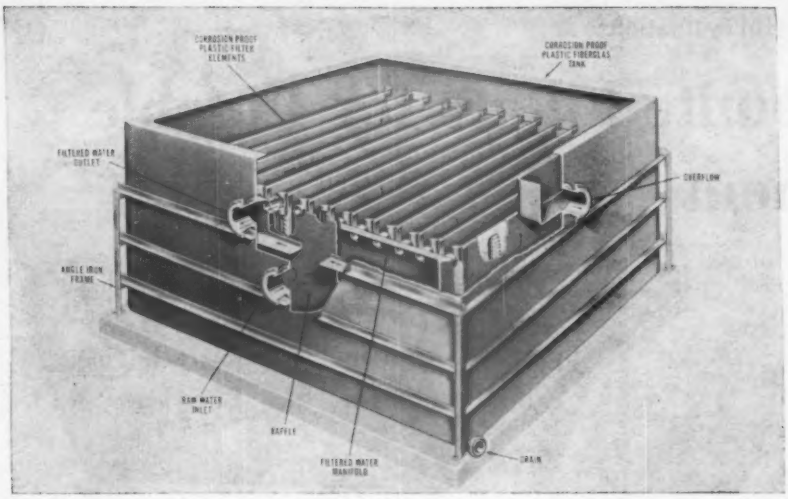

FIG. 1. SECTIONAL VIEW of the vacuum diatomite filter with leaf type elements.

Winterport, Me. has had a vacuum diatomite filter in operation since early last spring. Here the problem is one of turbidity removal since what color is present is within the allowable limits. The water is taken from a reservoir fed by a stream. At times the turbidity has been in excess of 100 mg/l.

At Jamestown, R. I., an experimental 200 gpm plant employing a leaf type vacuum filter was operated intermittently for a period of about a year on water which had been both coagulated and settled as well as water which had received prechlorination and chlorine dioxide treatment only. Results indicated that for most of the year a very satisfactory water could be economically produced without coagulation. During the periods of high color, when the concentration sometimes exceeded 100 mg/1, it would be necessary to resort to coagulation in order to reduce it to within limits. The overall cost of treatment would be approximately the same as when using the existing old, but satisfactory sand filter. If a new filter had been required it would have been more economical to go to diatomite.

Another interesting installation was made last year in South America by the Aluminum Corporation of America. The only available water supply at their instalation is a river, the water of which showed a concentration of from 200 to 4000 coliform bacteria per milliliter. The local natives will not drink chlorinated water as they believe it will make them sterile. This belief is so strong that they would drink from mudholes or directly from the river before drinking a chlorinated water, advised by the equipment manufacturer that while the vacuum diatomite filter was quite efficient in the removal of bacteria, it should not be depended upon alone but should be used with chlorination since without disinfection as a safeguard, too much depended upon proper operation. In spite of this recomendation the equipment was purchased and installed. Alcoa reports that the bacteria count has been reduced by filtration alone to within acceptable limits. This installation is being watched carefully by the local health officials who are quite enthusiastic about it.

Usefulness

Now that we have considered some of the applications of this equipment let us consider what are the advantages of gravity-vacuum filter aid filtration and what are its limitations.

Advantages 1. A higher degree of clarity in the effluent, 2. Ability to remove suspended solids with or without coagulation, 3. A high degree of bacteria removal, and 4. Excellent removal of algae.

Limits 1. While it will remove apparent color, the removal of true color without coagulation is very low, 2. Alum floc carry-over will blind off the filter cake rapidly, causing short runs, 3. Although in many cases turbidities as high as 60 to 100 mg/l have be removed economically without coagulation, there have also been cases where even with relatively low turbidities, the filter runs have been short and filter aid and labor costs consequently high, and 4. Iron floc reacts like alum floc and will shorten filter runs if allowed to be carried into the filter.

Filter Construction

Many of the same fundamental principals for sand filter construction pertain to the diatomite filter. Until recently, all diatomite or filter aid filters were of the pressure type where the filtering surfaces were enclosed in a pressure vessel. Although these were equipped with observation windows or ports, it was impossible to know that the precoat was properly applied thus insuring that all water would pass through the diatomite cake and be filtered.

Similarly, when the filter was backwashed, it was impossible to know that the filter was entirely clean. As a result, the filter elements became fouled to the extent that they would not properly precoat. Without precoat on a portion of the element to protect it, more and more of the element became fouled and unfiltered water passed through these areas until a filtering mat made up of a mixture of filter aid and debris had been built up.

The vacuum filter is an open tank unit with a multiplicity of porous filter leaves or tubes within the tank, connecting to the effluent line. Where there is sufficient head between the filter and the clear well it can be used entirely as a gravity filter. Most commonly, however, the effluent is connected to the suction of a centrifugal pump rated for the desired capacity at a total dynamic head which will deliver the flow against whatever back pressure there may be plus the maximum suction head which will be developed at the end of the run as the cake becomes clogged. This is usually total dynamic head of from 17 to 22 ft.

Because of the open construction it is usually possible to observe the filter cake throughout the entire run. When the end of the run is reached, the influent and effluent valves are closed, the tank drained and the spent cake rinsed or washed from the elements with a hose or by means of spray nozzles. This method of cleaning has been found to be more effi-

cient than back washing by means of a reverse water flow. Because of this Superior cleaning method and because a failure of any portion of the elements to take the precoat can be readily observed and remedied, the gravity vacuum filter can be and usually is maintained in a much more efficient condition than the pressure filter. Bauman[1] reports that: "The vacuum filter is much simpler to operate than the pressure. The observation of the septums in a vacuum filter during all phases of operation is a definite asset. Any failure in precoating of the septums, or a failure of the septums, sleeves or filter cake, during operation of this filter would be visible to the operator. This is a valuable characteristic in the filtration of a municipal water supply. Filter cake failure in a municipal plant could result in pollution of a potable water supply."

The diatomite filter has been likened to a slow sand filter and, like the latter, operates to best advantage at low rates. The usual design rate of such filters when handling water for potable or industrial use is between 0.5 and 1.0 gpm per sq ft of filter area.

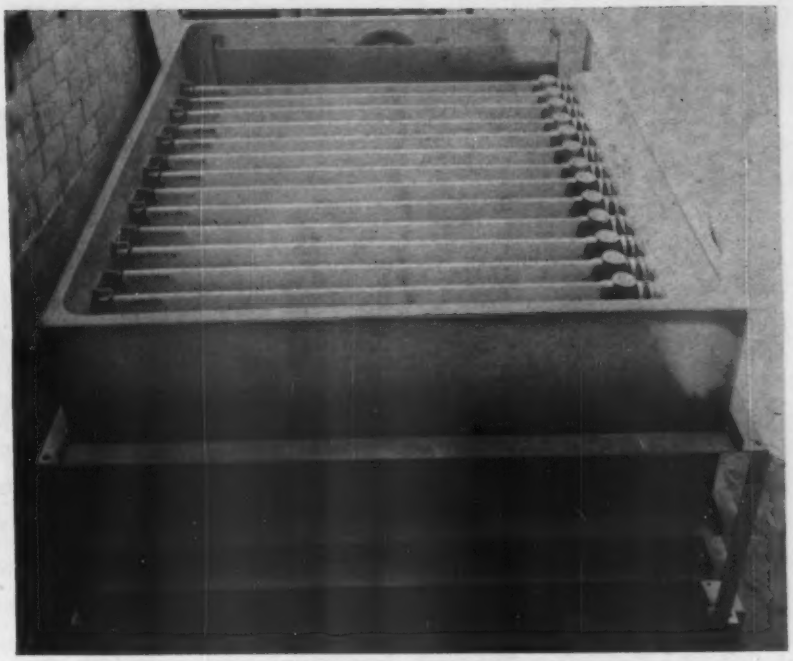

FIG. 2. AN OVERALL VIEW of a filter with leaf type elements.

Size

The pressure diatomite filter has a limited practical size. As the filter becomes larger, the problem of closure becomes greater and more expensive. In some cases, the closure of a pressure filter shell is more costly than the rest of the filter shell. Where the tank is open to the atmosphere as it is in the gravity filter, it only needs to be strong enough to support the head of water in the tank which is usually less than six feet.

With comparatively light stresses, it is possible to build tanks of almost any size using fiberglass reinforced plastic with supporting steel frame works. At the present time, this type of filter is built for water works use in sizes ranging from 108 sq ft to 648 sq ft which have capacities for flows of from 108 gpm to 648 gpm per unit. There is no reason why larger plastic filters of this type cannot be built and they have the additional advantage of being corrosion proof.

Several manufacturers are selling filter elements for installation in concrete tanks. Although as far as filtration is concerned, these will operate well, the concrete tank construction makes it inadvisable to acid clean the elements without removing them from the tank, an operation which can be carried out in the plastic filters. The same limitation applies to steel tanks, whether lined or unlined.

Filter Elements

Filter elements for gravity-vacuum units are made in a number of forms. While tubular elements have been most common, leaf type elements are in general much more desirable as they offer more plane surface thus making them easier to wash and to inspect. The element consists of an open core of fabricated metal or plastic which serves as the underdrain and is connected to the filtered water manifold. The core is covered by metallic wire cloth, perforated sheet metal, or by plastic cloth such as Orlon, Dacron, Nylon or polyethylene. The selection of such cloths is highly important both as to the type of strand and the weave. Where the entire element is of plastic, corrosion difficulties are eliminated. Bell[2] says of metal elements: "Electrolytic failures are frequent. These are often due to deposition of particles of iron oxide, from the other filter components or piping, in the septum openings. This is followed by galvanic action in which the septum furnishes the sacrificial metals. Other failures result from galvanic action between elements and other filter components, which can be lessened by use of insulating connections between component parts of filters."

Equipment

To insure efficient operation of a gravity vacuum filter unit the following equipment is required: A level control to maintain proper level of water over the filter elements, Filter, Vacuum gauge, Filter Pump, Vacuum limit switch, Equipment for body feed (Dry feeder with slurrying flume) and Rate of flow indicator.

Additional equipment which are considered desirable are: A rate of flow controller, Chemical Feeders, Chemical and diatomite feeder controllers, Recording meters for flow and vacuum, Automatic mechanically or hydraulically operated valves, and Automatic washing equipment.

The level controller should be a tight shutoff valve so arranged as to serve as the influent shutoff during washing or when the filter is taken out of service for any reason. The filter should be capable of operation at 0.5 gpm per sq ft for normal demand and not more than 1 gpm per sq ft for normal peak demands. The filter pump should be an end suction pump, either close-coupled or driven

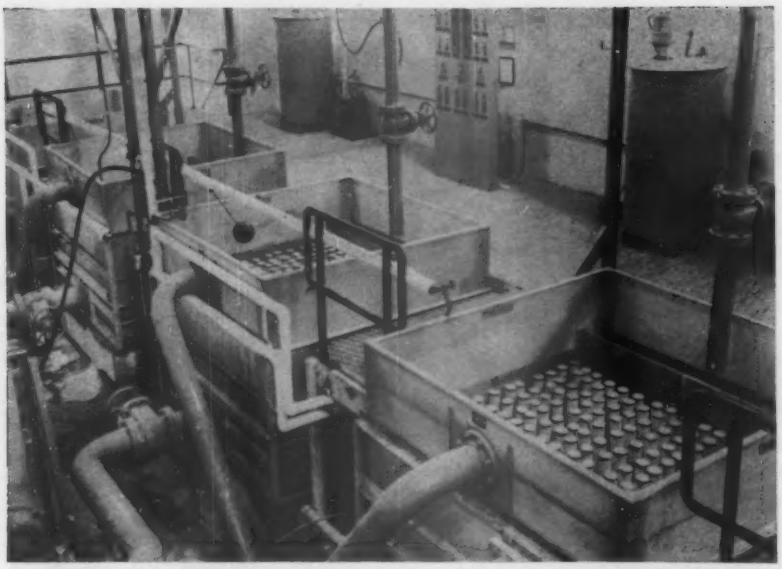

FIG. 3. A MULTI FILTER UNIT treating swimming pool water with tubular elements.

through a flexible coupling. The gland or seal should be under pressure.

As pointed out by Bell[3], the body feeder should be of the dry type with a slurrying flume and eductor so that the filter aid can be introduced into the influent line for good mixing.

The rate of flow indicator can be any one of several types but preferably should be one which can be used in conjunction with a rate controller and chemical feeder control as well as a recording meter.

The rate of flow controller may be either a standard water works unit or some other type which will interpose very little pressure loss when nearly wide open.

Comparative Costs

Bauman[4] and Bell[5] concluded that diatomite filtration of water is economical in comparison to sand filtration. Bauman ran extensive tests on iron bearing waters using both pressure and vacuum filters, during the period from September 1958 and May 1959, under a research grant from the National Institute of health. Bell's work was with a conventional sand filtration plant in which a battery of pressure diatomite filters had been installed and which could be used interchangeably with the sand filter. His study which extended over a period of several years was made on Raritan river water. This water varied widely in both turbidity and algae content. Turbidity ranged from 2 to 800 units by silica scale determination, with an average of 11 units while color ranged from 3 to 400 mg/l, averaging 28. Pretreatment was accomplished in an upflow basin, the operation of which was upset at times due to varying temperatures and the flashy chemical characteristics of the water.

Table 1

Comparative Costs
Sand and Diatomite Filters†

	Capital Costs* (Zmgd capacity)	Operating Costs* (per million gallons)
Diatomite filtration of raw water	$161,630.00	$45.71
Diatomite filtration of pretreated water	$201,790.00	$55.22
Sand filtration of pretreated water	$296,581.00	$45.31

*1956 dollars

† after Bell[5]

Bell's work was particularly interesting as it presented cost comparisons between the sand and diatomite operation as well as on diatomite operation with both pretreated and untreated water. His figures for the installed cost of 2 mgd water plants as of 1956 are given in Table 1.

Based on an annual production of 560 mil gal the total operating cost, including chemicals, power, maintenance, amortization and debt service are also given in Table 1.

As the pressure filter requires a pump designed for a total dynamic head of 100 ft, whereas the vacuum filter requires only 35 to 45 ft total dynamic head, the power costs for the latter would be lower. On the other hand, it is possible that because the pressure filter can be operated to higher differentials, the cost of diatomite might be greater for the vacuum filters. This difference, however, would tend to be equalized by the ability to maintain the filter septums of the vacuum filter in a cleaner condition.

It is generally agreed by those most interested in the development of diatomaceous earth filtration that a proposed diatomite filter plant project should be handled under the guidance of a competent consulting engineer, that full chemical and physical data be obtained on the water and, if possible, a series of pilot runs should be made on the water during the season's high turbidity and high algae.

New A.W.W.A. Water Meter Manual

A new manual on Water Meters has just been published by the American Water Works Association, 2 park Ave., New York 16, N. Y. This 88-page book discusses the essentials of cold-water meter selection, installation, testing and maintenance.

Its concise text is liberally illustrated with photographs and drawings, and is further amplified by tabular data that is presented in pertinent sections. In addition, a brief chapter outlining the history of water meter development is included.

The manual was prepared by the A.W.W.A. Committee on Meters and is designed to fill a long felt need for a practical guide in this field. Entitled AWWA M6, it sells for $1.25 a copy.

How to turn possible problems into advantages is reported in . . .

Model Sewer and Water Planning

by F. G. GOFF, Administrative Assistant,
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Minneapolis, Minn.

EDITOR'S NOTE: A most common situation encountered in this country today is a suburban community with "growing pains". These "pains" frequently take the form of large areas with inadequate sewage disposal, lawn sprinkling restrictions during the summer months and all too frequently the very serious situation of an actual water shortage or a serious health problem growing out of overflowing septic tanks or cesspools. Few in number are the towns which have coped with the problem of a rapid population expansion without some problems and still fewer are those communities which actually planned for their population growth and were prepared for it when it occurred. New Hope, Minn., is one of those farsighted communities and their preplanning is the subject of this article. Located in the Minneapolis-St. Paul metropolitan area with good rail and highway connections to the city, New Hope with its large undeveloped area was obviously in for a population boom. With a tight soil, no public water supply or sewer system, and no set of planning ordnances to regulate development it was also obvious New Hope was in for a severe case of "growing pains" unless something was done. The village fathers recognized the problem and established a comprehensive program to solve it. A planning Commission was established which, with the help of a consultant city planner prepared an overall plan for the village and prepared the ordinances to implement it. Consulting engineers planned and supervised the construction of the trunk sewers and the basic parts of the public water system. As a result of this foresight New Hope today is ready to handle any population boom.

■ THE SUBURBS SURROUNDING the metropolitan city of Minneapolis, Minnesota, like other suburban areas of the United States have been faced with many problems, both economic and technical, as a result of the population expansion following World War II. The rapid population increase has forced suburban areas to solve problems of sanitation, health, school construction, and engineering much earlier in their existence than they were prepared to do so financially or technically.

The major problems requiring immediate attention and solution were the need for sanitary and storm sewer systems, water distribution systems, streets, curbs and gutters to provide adequate health safeguards and

SEWER CONSTRUCTION through an undeveloped area

INSTALLING a house sewer

transportation facilities. Few suburbs have been allowed the proper time to follow the desired sequence of events necessary to assure a sound tax base, well balanced development, and an economically operated government structure.

Development by Plan

The ideal progression of events leading to a well developed and coordinated suburban operation would be:

(1) Formation of a binding ordinance system to control development of residential, commercial, and industrial potential.

(2) Development of a comprehensive and binding master plan of the suburb to control zoning, street patterns, traffic, etc.

(3) Preparation of a master plan for sanitary and storm sewers, and water distribution system.

(4) Installation of a trunk sanitary sewer system before final development of suburban areas.

(5) Completion of streets surfacing and curb and gutter insulation on a final basis after all utilities have been installed.

The Village of New Hope, Minnesota, is one of the few suburbs in the Minneapolis area that has been able to proceed along the lines of the progression mentioned above.

DEEP MANHOLES such as this were required in many cases in New Hope

Location

The Village of New Hope is located approximately 8 miles from the heart of Minneapolis, Minnesota. The 5.1 square miles of the village is rolling in character suitable for building of split-level homes. The total population of New Hope as of 1960 is 2,500 with a potential to be reached by the year 1970 of 17,000 inhabitants. The greater portion of land, about 75 per cent, is still pastures, woodlots and cornfields. A majority of the farms have been sold to development companies at many times their original value as a result of the inauguration of the accelerated sanitary sewer and water distribution system construction program. These companies plan in the next two years to completely develop the areas for residential, commercial and industrial uses.

New Hope can boast of an excellent transportation system giving it access to both the city and suburban areas. U. S. Highway 12, reached easily from New Hope, provides access for the residents and industries to the metropolitan areas. The main line of two railroads pass through the village providing rail service to the industrial areas. This ideal transportation situation is invaluable in attracting residential, industrial, and commercial interests to the village.

Preparations

The village council realized that a program of aggressive, coordinated planning would be necessary if the Village of New Hope was to escape the problems bound to result from the population boom sure to come to the as yet untaxed northern suburban areas. Two major items that had caused considerable concern to other suburbs were the need for sanitary sewers and a water distribution system. The dense clay soil in the area precluded any thought of developing the area without a guarantee of a municipal water and sanitary sewer system. The mayor and the council realizing that some provisions for a sewer and water system was necessary before full village development could be contemplated, decided to employ a consulting engineering firm to study this problem.

The council employed the author's firm to make a preliminary study of the sanitary sewer requirements of

the village. Aerial surveys were employed to provide a topographical map of the village for use in the engineering survey and later to aid in the assessment process.

To implement the preparation for a population increase the village council immediately began to formulate binding building codes and development requirements. A Planning Commission was organized to study and approve all plats and to make recommendations concerning overall village development. Provision was made to set aside land for parks, schools and playgrounds. A consulting city planner aided the Commission in the designation of areas that should be residential, industrial, or commercial and a general agreement was reached on the proposed street pattern to be developed.

Sewer System

The preliminary sanitary sewer report prepared by the Consulting engineers was completed in February 1956 and approved by the village council at the subsequent council meeting. The report recommended connection to the sanitary sewer system of the neighboring suburb of Golden Valley and proposed that New Hope share in the cost of increasing the capacity of the Golden Valley Trunk Sanitary Sewer which connects to the Minneapolis-St. Paul Sanitary District. The flow charge was to be on a metered basis and a detention tank was to be provided at the village boundaries by New Hope to handle ultimate peak load on a 24 hour basis. The design was based on Minnesota State Board of Health standards of 250 gallons per capita with an estimated sewage volume of 14 cfs based on 2,675 sewer acres having an average of 10 persons per acre.

The councils of New Hope and Golden Valley reached an agreement on joint use of the sewer system and arrived at a basis for dividing the cost. New Hope agreed to pay 75 percent and Golden Valley 25 percent of the cost of the additional trunk sewer capacity. Approval was received from the Minneapolis-St. Paul Sanitary District and the Minnesota Board of Health which paved the way for the building of the first trunk sanitary sewer. By February 1957 authorization to prepare plans and specifications for the first trunk sewer was received. This line was completed in December 1958 at a cost of $686,000. The authorization for the remaining trunk sewers followed closely with the final trunk sewer completion anticipated for June 1960. A total of 47,000 ft of trunk sanitary sewer was constructed at a total estimated cost of $1,342,144. To this must be added New Hope's share in the cost of oversizing the Golden Valley system which amounted to $187,000. Along with the trunk sewer system the village council authorized the construction of approximately 73,000 ft of lateral sanitary sewers at a cost of $601,600.

EARLY STAGES of sewer construction

Water System

In conjunction with the development of the overall sanitary sewer system the village council authorized their consultants to prepare a preliminary study of a proposed water distribution system for the village. The first deep well and pump as well as part of the trunk sewer system was authorized by the council in April 1959 and construction was completed in December 1959 at a total cost of $297,000. Additional water mains have been constructed as developers requested water service for their projects. The end of 1960 should see the village with a considerable percentage of its water distribution system completed and financed primarily on a revenue basis. Developers will construct the water laterals themselves according to the village master plan and include the cost in the sale price of the homes.

The near completion of the trunk sanitary sewer and water distribution system means that New Hope will be prepared for the population boom sure to come to this suburb and many others in the northern part of the Minneapolis metropolitan area. The village officials who had the foresight and the courage to forge ahead on village planning can point with pride to the great progress that has been made to date. The initial cost of both systems was far less, since the majority of sewer was through farmlands and unplatted areas. The street pattern could be coordinated with the proposed sewer and water routes. Developers were encouraged to buy up farmlands and develop them for sale with the promise of sewer, water and other vital utilities. Industrial and commercial developers found it convenient to locate in a village with these public utilities furnished in addition to the adequate transportation facilities and favorable tax structure.

The careful efforts of village officials to follow the ideal method to develop a village was intended to avoid the problems of other suburbs in the area. It was hoped by having utilities in place beforehand and by proper planning to avoid relaying a street several times, or being confronted with a storm drainage problem caused by improper development of land, or pollution of the water table casued by too many cesspools. In two years it is the hope of the mayor and the council that sewer and water and public utilities like gas and power will be completed in the village. They can then offer a brand new village to residential, commercial and industrial developers complete with a water system, sanitary and storm sewer system, and city gas and power.

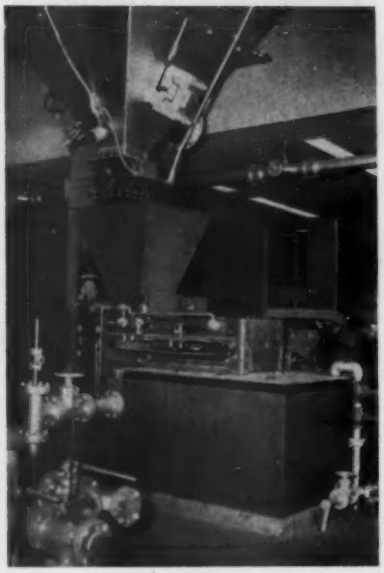
The New Hope, Minnesota experiment should be seriously studied by new communities who in the near future will be faced with a similar problem. Proper planning, ordinances, plans for public utilities, progressive and aggressive programs of action will greatly reduce the problems faced by suburbs today caught by the population boom. The challenge today for public officials is to have the courage to forge ahead with vision and provide to potential residents a village complete with all utilities, planned, orderly growth, useful ordinances and a reasonable tax structure.

Philadelphia's Torresdale plant is equipped with . . .

Push Button Chemical Feeders

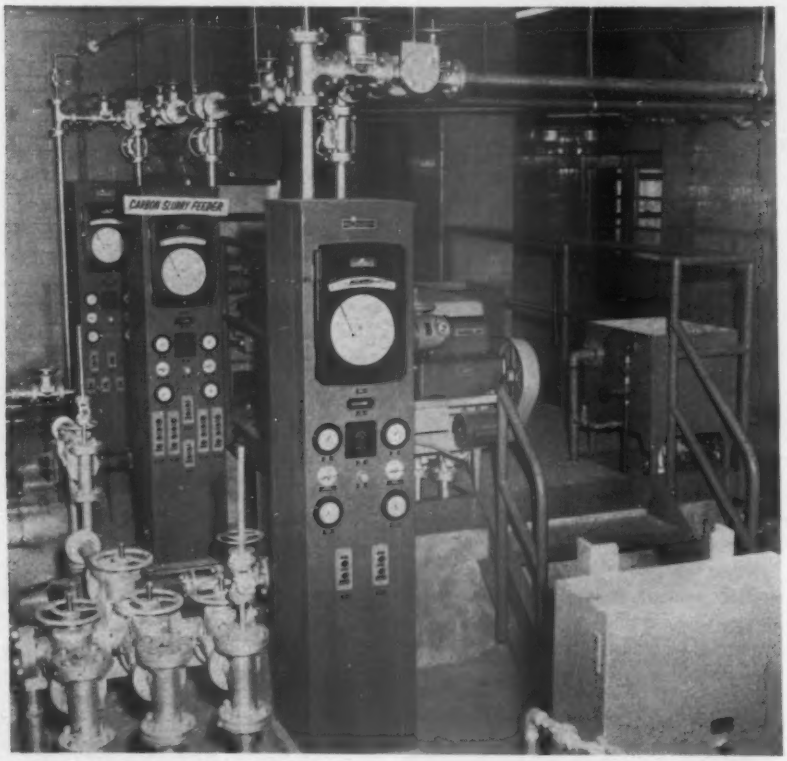
A STAFF PICTORIAL REPORT

RESUME: Convert pressure differential to pneumatic control signals and you have the basis for a control system. All chemical feeders at the new Torresdale Plant utilize the maximum available pneumatic instrumentation to permit virtually complete automation.



CLOSE-UP of one of three dry alum feeders. Cover plate has been removed showing compact scale beam assembly. Dissolving water inlet at right, chemical solution outlet from tank at left. Vibrator may be seen above feeder on bulk storage bin transition section.

■ CONTROL OF PRE-TREATMENT chemicals at Philadelphia's new Torresdale Water Treatment Plant was conceived by Morris-Knowles, Inc. to be the ultimate in self-sustaining automation. In a previous article (W&S Nov. 1959) details of the plant's construction and filter control system were presented.

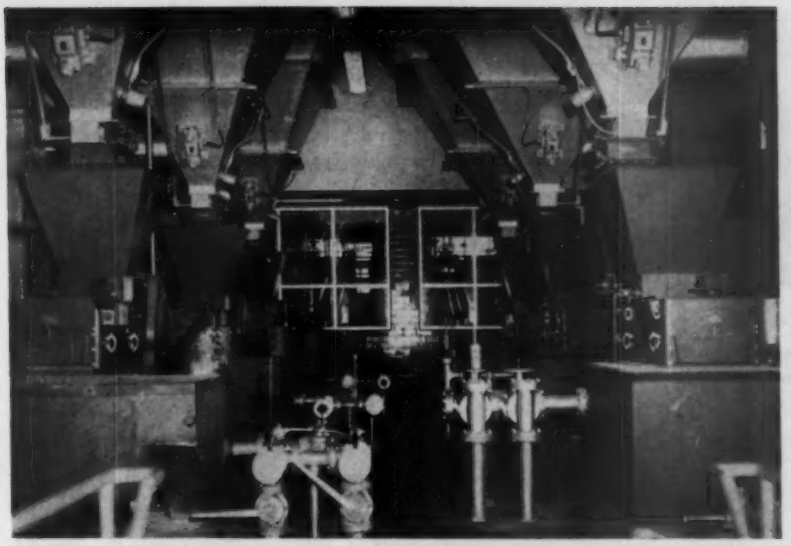


CONTROL PANELS for carbon slurry feeders. Rotodips are installed on platform elevated above floor level. On platform to right of steps is pump float tank. Panel feed rate indicators and recorders are selsyn-driven from feeder drive mechanism.

Flow to the plant from the Delaware may be through either one of two 96" Venturi tubes. It was necessary therefore to permit chemical feed proportioning to flow through either meter. With twelve chemical feeders, three each for liquid alum, dry alum, quicklime and carbon slurry, considerable duplication of the basic control diagram was required. Each chemical feeder has its own control panel on which is located an air switch to transfer from one Venturi to the other, indicator and chart recorder, totalizer, dividing relay to permit dosage control and automatic-off-manual selector switch. Start-stop switches, operating lights, and air pressure gauges are also provided.

Liquid Alum

Liquid Alum feed rates of 30-600 GPH are provided by Rotodip feeders. The liquid is pumped to each feeder where the varaible speed drive, positioned by a pneumatic positioner, rotates the dipper wheel at rates proportional to plant influent. Manual dosage selection permits increase in



GENERAL VIEW of belt gravimetric feeders. Dry alum units at right and quicklime at left. Surge hopper above feeder provides even transfer of chemical from large overhead storage bin to feeder inlet.

percentage of maximum rate desired, depending on coagulant requirements. Manifold discharge piping permits use of feeders interchangeably for various points of application.

An interesting accessory on all pneumatic positioners permits overriding the pneumatic system. By operating a hand-wheel the variable speed drive may be adjusted manually throughout the feed range. This feature permits operation during outages of the pneumatic system. Feed rate indication and totalizing are provided for operator convenience and plant record purposes. Charts provide a permanent record of chemical fed and feeder performance.

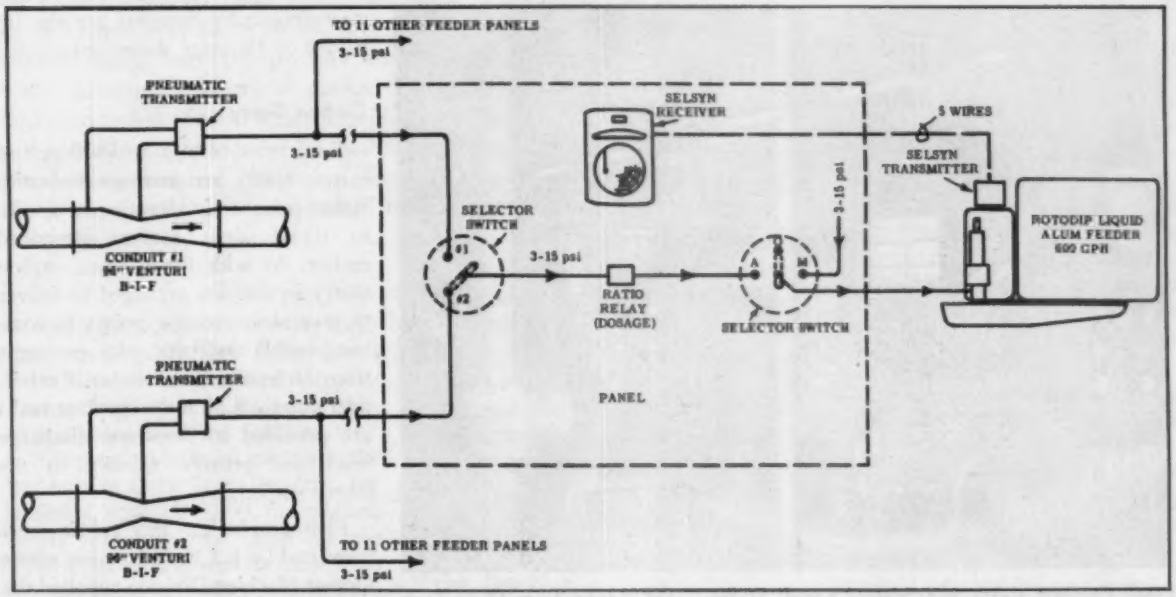
Dry Alum

Belt gravimetric feeders were selected for dry alum, which, together with their dissolving tanks are rated 150 to 3000 pph. Panel arrangement and pneumatic control is virtually the same as previously described for liquid alum feeders.

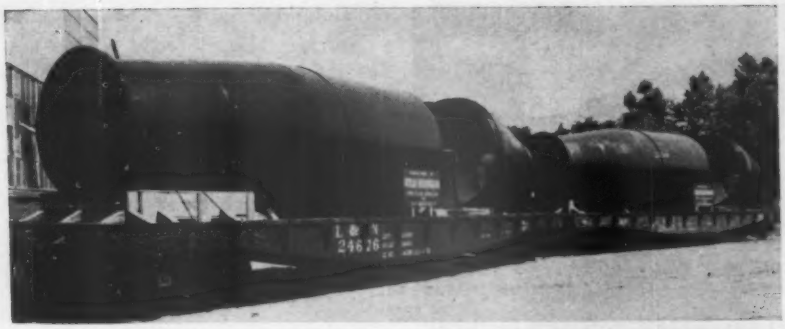
Storage bins, directly above the feeders are equipped with vibratory hopper agitators, high and low level bin-indicators and motor-operated outlet gates. Between the storage hopper outlet and chemical feeder is a surge hopper to insure adequate supply of chemical to the belt feed mechanism.

Belt feeders themselves reflect the

SHOWN HERE on lime feeder and slaker is vibrator, electric-driven bin gate, and surge hopper. Hand wheel on pneumatic positioner permits local manual feed rate adjustment during outage of pneumatic system.



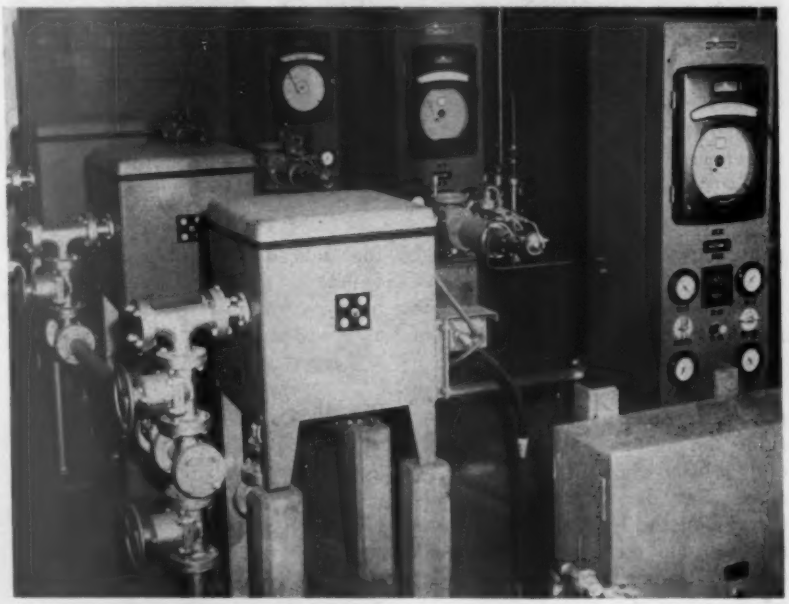
SCHEMATIC representation of Torresdale's pneumatic pacing and control system for chemical feeders. Controls for Liquid Alum Rotodip are shown, diagram is duplicated for eleven other pre-treatment chemical feeders.



TWO FLAT-CARS are required to transport one 96" dia. Venturi tube from foundry to the Torresdale plant site. Two of these are installed at Torresdale. Throat section may be seen standing on end at right of sign.

plant. The slakers were moved to their new location and installed, together with belt gravimetric feeders of the type described above to handle feed rates between 5 and 1000 pph.

Slaking water is fed proportional to lime feed by means of a differential controller connected to the feeder variable speed drive. Linkage with a water meter and motorized control valve completes the water control loop. Hydraulic dust and vapor removers, grit removal troughs, ther-

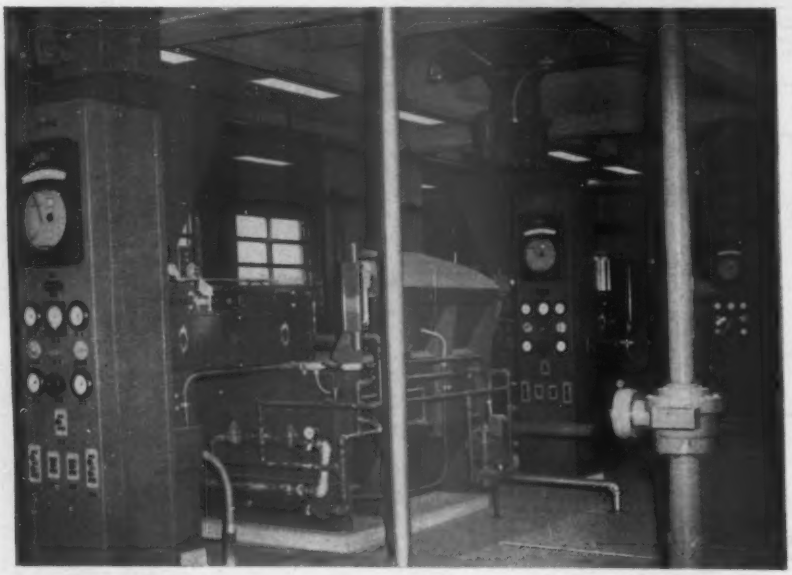


LIQUID-ALUM ROTODIPS and control panels. Note concrete pedestals supporting feeders above floor level, pipe manifolds and pneumatic positioner for feeder variable speed drive.

latest design, each having constant weight on the belt, variable belt speed, mechanical inlet gate control and discharge sampling chute. Dissolvers are equipped with dual mixers, outlet weir sections, drains, hydraulic dust collectors and drain outlets.

Quicklime

Selection of quicklime for pH control resulted in an economy for Torresdale. Detention-type lime slakers were available from the Queenlane



LIME FEEDER slaker and control panel. Slakers were moved from Queenlane plant to Torresdale. Re-piping included provision for blending hot and cold water for slaking purposes.

mometers and rotameters are also included to facilitate slaker operation.

Carbon Slurry

Feed rates from 5 to 1800 gph of carbon slurry are accomplished with Rotodip feeders. Operation is similar to liquid alum feeders described earlier. As with liquid alum, carbon slurry feeders are arranged to deliver to several application points to combat possible taste and odor problems from Delaware River water. Centrifugal pumps, with make-up float tanks are provided to overcome discharge head and provide velocity to the slurry suspension.

Photographs for this article were furnished by B.I.F. Industries, whose Omega Machine Division supplied the Torresdale chemical feeders and control system.

An uncommon collection of problems of considerable magnitude and complexity are reported in . . .

Race Track Water Supply and Drainage

by W. J. TALLAFUSS and J. SIDERAN
Building Service Engineer and Engineer
Building Service Division
Stone and Webster Engineering Corp.
New York, N.Y.

EDITOR'S NOTE: When one thinks of a race track a complex water supply and drainage system do not come immediately to mind. However when this phase of the design problem is studied many interesting aspects of the situation present themselves. The Aqueduct Track on Long Island whose system is described here covers 203 acres, has an estimated water demand of 1000 gpm, capacity to provide food service for 14,000 persons at the same time, 800 ton of air conditioning and other requirements ranging from a 25 bed hospital to a photographic laboratory. To make the problems more interesting most of this demand has to be supplied during the relatively short period day when races are in progress. Track watering alone on hot days uses 20,000 gal per race and the equipment to fill the tank trucks must be capable of filling them at 2000 gpm. Storm drainage from the 80 acres of parking area, 4 miles of roads and 280,000 sq ft of plaza plus that from 6 acres of roof had to be almost all returned to the ground since the track could contribute to the municipal storm drain system only some 20 cfs. A tankless automatically controlled system using four pumps was designed to meet the domestic water demand. One gravel packed well with an elevated storage tank and two diffusion wells provided and returned to the ground air conditioning water while two underground storage and disposal areas handled the storm water. These three systems give the track a quite different and effective water supply and storm drainage system.

■ THE NEW AQUEDUCT thoroughbred race track, located on Long Island near Idlewild International Airport, lives up to its name in the importance of its water handling facilities.

Aqueduct, which is not only the largest race track in the country, but probably, at $33,000,000, the costliest sports structure ever built in the United States, acquired its name from the adjoining aqueduct which once supplied water to Brooklyn.

Originally established in 1894, the old Aqueduct Race Track was completely razed to make way for the new 203 acre racing plant. It is now owned and operated by The New York Racing Association, Inc., a nonprofit organization which also operates Belmont Park on Long Island and Saratoga in upstate New York.

Water Needs

The domestic water supply for the grandstand and clubhouse, Fig 2, which is one fifth of a mile long, 110 ft high at its maximum point and covers 7 acres of ground, must be adequate to serve the large crowds expected. This includes water for plumbing fixtures, drinking fountains, water coolers, numerous concession stands, kitchens and restaurants.

The plumbing system required 30 miles of assorted piping, using copper, steel, wrought iron, and cast iron for various services. More than 1,000 plumbing fixtures were used, including over 300 water closets, 200 urinals, 200 lavatories and 70 water coolers.

Water had to be provided for all the food service facilities. These facilities are capable of serving 14,000 persons at one time and are located at convenient places for the spectators. Included are four dining rooms and cafeterias, a main clubhouse restaurant accommodating 1,200 persons with a spectacular view of the New York skyline, and in addition numerous bars and concession stands.

Scores of other water uses were provided for, ranging from drinking fountains, showers and surgical sinks in the 25 bed hospital and first-aid rooms to developing tanks in the darkrooms where the photo-finish films and other photos are developed.

An independent water system was installed to provide for the stable area to serve the drinking and washing requirements of 500 horses as well as the needs of the cafeteria, showers and fountains for grooms and stable hands.

Air Conditioning, Lawn and Track Watering: a dependable supply of water was required for the 22 air-

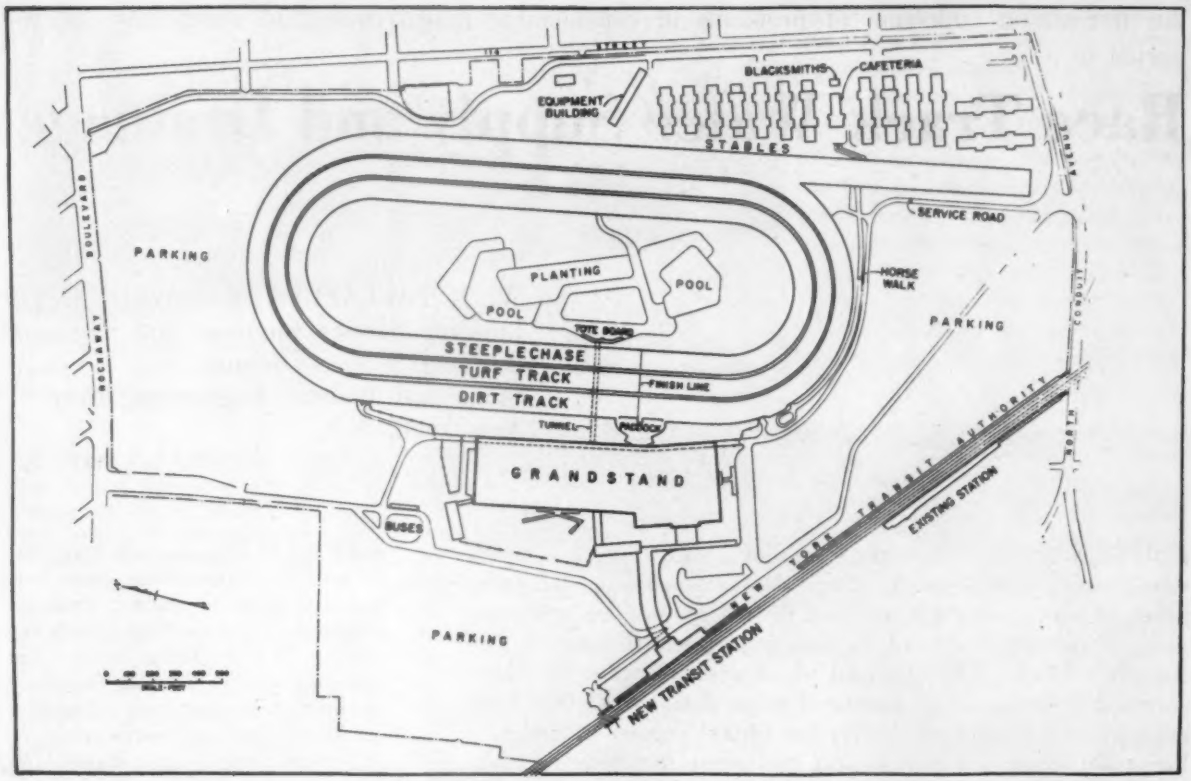


Fig 1 PLOT PLAN of the new Aqueduct Race Track

conditioning systems, having a total capacity of over 800 tons of refrigeration with a water demand of 700 gpm.

A system for lawn and track watering was installed to provide an adequate supply of water for the track to keep it in proper condition for racing and for watering the landscaping which covers 60 acres of Aqueduct's total area. The water demand for track watering on hot days approximates 20,000 gal per race to be sprayed by special trucks between each race.

Drainage: two major drainage problems confronted the engineers who designed Aqueduct. One problem was disposal of water used in the air-conditioning systems at a rate of 700 gpm. The other problem was to prevent flooding during rainstorms of more than 80 acres of parking areas for 12,000 cars, 4 miles of roads, 280,000 sq ft of plaza areas and walks and the dirt and turf racing strips, Fig 1. The roof drainage was also a part of this problem requiring the disposal of rain water from over 6 acres of roof area.

The estimated domestic water flow rate of 1,000 gpm, or 1.44 mgd, was established for the grandstand and clubhouse based on the recommendations of the National Plumbing Code ASA A40.8 and was derived from the probable use of the number of plumbing fixtures, totaling over 1,000, and estimated demand of the restaurants and other dining facilities. A water pressure of 73 psi gage was required at the ground floor level in order to maintain a residual pressure of 15 psi at the fixtures on the fourth floor with 1,000 gpm load. A 10 in. underground main, approximately 1,200 ft long, connects the grandstand and clubhouse with the city water system.

Water Supply Systems

The minimum static pressure in the city main at the tapping point is 30 psi gage with no water demand by the track. To provide adequate pressure for the plumbing system, pressure boosting pumps were installed. As in any domestic water supply system for a municipality or other large system, the sizing and control of the booster pumps are most important. The use of an elevated storage tank on the main structure roof or on independent supports proved to be undesirable from aesthetic and economic viewpoints, as did pneumatic tanks, although they are used elsewhere at the track in the smaller systems. Therefore, the desired system had to be a tankless one and a multiple pump installation was adopted, consisting of four pumps, two pumps rated at 220 gpm at 40 psi each, one of which is a stand-by, and two rated at 500 gpm at 47 psi each.

The operation of these pumps is by automatic pump control, consisting of a venturi type meter, a transmitter and a receiver. The receiver, in addition to recording, indicating and totalizing the water quantity, is arranged with a swivel plate which causes mercury tip switches to open or close, as necessary, to control pump operation.

The sequence of operation is as follows:

During track meets, one small pump is in operation at all times to maintain pressure in the system. In order to prevent excessive heating of this pump, when the water consumption is low or nil, a small amount of water flows to drain through a regulating

valve. As the water demand increases to 220 gpm, one of the 500 gpm pumps is actuated and the two pumps working together supply the system demand up to 810 gpm where the combined pump curve meets the system curve at a pressure of 70 psi. When this demand is exceeded, the third pump is actuated to provide a maximum capacity of 1,130 gpm at 78 psi gage pressure with the three pumps operating together. As the water demand decreases, this sequence is reversed.

During the off season, the control of one small pump operation is transferred manually to a pneumatic tank. Automatic pressure and level controls associated with the tank operate the pump intermittently to maintain pressures above 15 psi at the highest fixture served by this system.

Air Conditioning, Lawn and Track Watering

The New York Racing Association, Inc., provided its own water supply consisting of a deep well, complete with deep well pump and accessories. This avoided excessive demands on the public water supply system of The New York Water Service Corporation and utilized the partial refrigeration effect of low temperature water.

Aqueduct uses city water for its public facilities, but uses water from its own deep well for the demand rate of 1 mgd required for the air-conditioning systems. Then, in line with modern conservation practice, this same well water is used for watering the race track, acres of grass and make-up due to evaporation in the infield lakes.

During normal operation the water flows through the air-conditioning system to the lawn and track watering system, or through a back pressure valve to disposal in diffusion wells. When water for air conditioning is not required, flow is diverted automatically to the lawn and track watering system and to the infield lakes for make-up. Some of the outstanding features of this system are the 700 gpm supply well, the two diffusion wells rated at 350 gpm each, and the elevated water storage tank.

The supply well is of the gravel wall type, developed by artificially introducing g r a v e l surrounding the screen. This type of well was dictated by the water-bearing formation which is typical on Long Island, consisting of sand and gravel. The total depth of the well is 150 ft, of which 50 ft is 12 in. nominal diameter stainless steel continuous "V" slot type screen, and 100 ft is 12 in. permanent inner casing. The outer diameter of the well is 36 in.

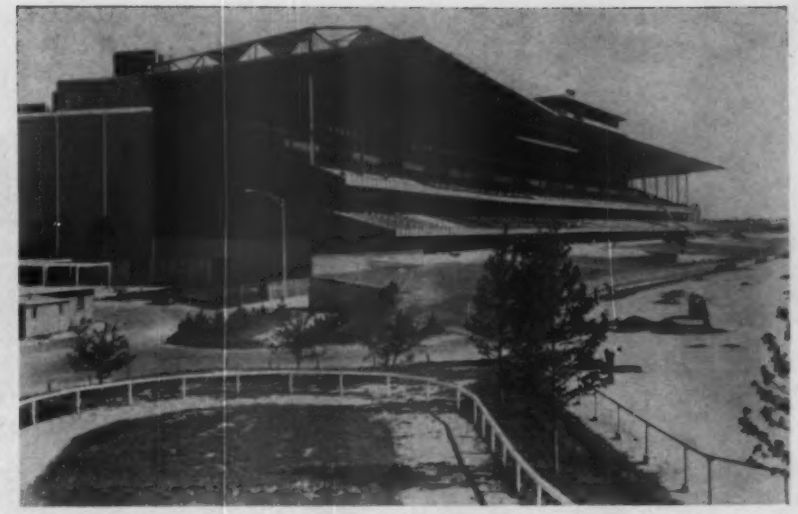


Fig 2 THE NEW TRACK'S GRANDSTANDS

A completely separate water disposal system was provided for the water taken from Aqueduct's own deep well. This system consists of two diffusion wells which take back to the ground the excess water used by the air-conditioning systems that is not needed for lawn sprinkling and track watering. The diffusion wells are in accordance with the requirements of the Water Power and Control Commission of New York State Department of conservation to maintain Long Island's underground water table and prevent salt intrusion. Each diffusion well is 60 ft deep, has an outer casing diameter of 40 in. and has a diffusion capacity of 350 gpm. The capacity of the two diffusion wells is equal to the 700 gpm capacity of the supply well.

An elevated water storage tank, Fig 3, was erected in the stable area across the track from the grandstand. This tank is required to supply the special trucks used for spraying as much as 20,000 gal on the track between each race. The races may be scheduled at from 20 to 30 min. intervals. For approximately one third of this interval, horses may be on the track during, before and after the race, which leaves less than 20 min for the watering of the 1½ mile track by two 2,000 gal and one 6,000 gal capacity trucks. The tank enables the trucks to be refilled at a rate of 2,000 gpm and, together with the well pump, supplies the 20,000 gal needed.

The tank is a spherical pedestal-mounted type, having a capacity of 10,000 gal and a height of 30 ft as measured from the top of the tank foundation to the low water line. An emergency valved connection with air gap to the city water system through the stable area yard piping is provided for emergency tank filling.

Drainage System

The storm sewer system was designed to drain the site using the following rainfall intensities: Rainfall in 24 hr, 2½ inches; Rainfall in 1 hr, 1 inches; Rainfall in 2 hr, 1½ inches.

Since the off-site disposal into the municipal storm sewer system was limited by the authorities to 20 cfs, excess water had to be temporarily stored or disposed of underground. An underground s t o r a g e disposal structure was provided, having a capacity of 37,800 cu. ft. This was constructed of corrugated multiplate arch, having a 10 ft span and 5 ft 3 in. rise, supported on a 2 ft high continuous concrete footing which provided a storage capacity of 60 cu ft per linear ft.

To reduce the capacity of this impounding reservoir to a minimum, the storage capacity of all the yard piping and man-holes was considered in the computations and the leaching of storm water to the ground was utilized.

Fig 3 THE ELEVATED TANK used to supply the tank trucks which wet down the track between races.

In addition, provision was made to accomplish maximum leaching by the proper design of the storm system piping. All piping 24 in. and smaller was made of porous or perforated concrete installed in proper bedding, also the bottom of the impounding reservoir was prepared for maximum leaching with coarse sand and gravel bedding. The leaching rate based on the type of soil encountered was established at 100 gal per day per sq ft.

The total length of the impounding reservoir constructed was 630 ft x 60 = 37,800 cu ft.

In addition, provision was made to accomplish maximum leaching by the proper design of the storm system piping.

In addition to the drainage facilities for the main track and parking areas, a drainage system was constructed to serve the stable area independently. The conditions here were somewhat different from those in the main track area; namely, there was no municipal sewer that could have been utilized economically, and a large amount of the storm water to be disposed of drained from adjacent city streets toward the lower level stable area. The drainage system installed consisted of an underground impounding reservoir similar to the one constructed in the main track area and an open type leaching reservoir having an effective volume of approximately 100,000 cu ft.

In order to minimize clogging and consequently costly maintenance of the artificial porous beds in both reservoirs by leaves, fine sand and dust, which would be received from the streets with the rain water, special settling type catch basins with trash screens were constructed at all locations where street drainage was collected.

The rational method was applied to the design of the storm sewers, with the rainfall intensity based on the formula

$$R = \frac{120}{t + 20}$$

Where R = rainfall intensity in in/hr and t = concentration time in minutes.

Runoff coefficients used were 20 per cent for unpaved areas, 90 per cent for paved areas and 100 per cent for roofs.

The storm sewer system installation was completed over a year ago. Since that time, storms of larger intensities than the designed criteria have occurred and the system has proved highly satisfactory.

West Virginia Plans Water and Reclamation Projects

Plans to spend some $5,024,000 in fish, water and reclamation projects in West Virginia were recently outlined and discussed by State Conservation Director, Warden M. Lane, in a report to Governor Underwood.

The report disclosed that the proposals were closely related to the state's ranking as 49th among the 50 states in the amount of surface water it has. It was also pointed out that damage from mine acid drainage amounts to about $3,190,000 a year in the Upper Ohio Valley alone to domestic and industrial water supplies, steamboats and barges, power plants and river structures.

As proposed by Mr. Lane, the mine-sealing operations would cost about $410,000 a year. The plans call for sealing about 100 mines a year, and it has been estimated that there are 493 abandoned mines in the counties dependent on the Monongahela River system in north-central West Virginia.

The projected stream improvement would concentrate about headwater flood control reservoirs.

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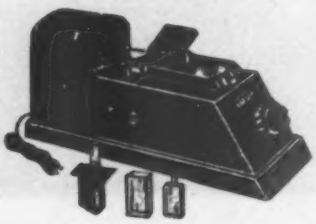

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Meetings

CONTINUED FROM PAGE 38A

Jun. 20-24—New York, N. Y. (*Manhattan College*) Fifth Course on Bio-Oxidation of Organic Wastes Theory and Design. Write: W. Wesley Eckenfelder, Civil Engineering Dept., Manhattan College, New York 71, N. Y.

Jun. 20-24—Scarborough, England
Institute of Sewage Purification, England Secy: W. F. A. Snook, 10 Cromwell Pl.,So. Kensington, London, S. W. 7, England

July 24-Aug. 5—Columbia University (*Arden House*) Harriman Campus. Ninth Annual Utility Management Workshop

Aug. 29-31—Cincinnati, Ohio. (*Sanitary Engineering Center*) Public Health Service Symposium on Water Robert A. Taft Sanitary Engineering Center, 4676 Quality Data Collection and Utilization. Director, Columbia Parkway, Cincinnati 26, Ohio

Sept. 12-14—Knoxville, Tenn. (*Andrew Johnson Hotel*) Kentucky-Tennessee Section A.W.W.A. Harold F. Mount General Manager, Preston Street Road Water District No. 1, 5400 Preston Highway, Louisville, Ky.

Sept. 14-16—Virginia Beach, Va. (*Cavalier Hotel*) Virginia Section A.W.W.A. Secy: Edward H. Ruehl, R. Stuart Royer & Assoc., 15 West Cary St., Richmond, Va.

Sept. 14-16—Saranac, N. Y. (*Saranac Inn*) New York Section A.W.W.A. Secy: Kimball Blanchard, New York Branch Sales Office, Neptune Meter Co., 2222 Jackson Ave., Long Island City 1

Sept. 14-16—Whiteface, New York. New York Section A.W.W.A.

Sept. 14-16—Virginia Beach, Va. Virginia Section A.W.W.A.

Sept. 18-21—New England Water Works Assn.

Sept. 21-23—Traverse City, Michigan. Michigan Section A.W.W.A.

Sept. 21-23—Sioux Falls, South Dakota. North Central Section A.W.W.A.

Sept. 25-27—Jefferson City, Missouri. Missouri Section A.W.W.A.

Sept. 25-27—Jefferson City, Mo. (*Hotel Governor*) Missouri Section Water Pollution Control Federation

Sept. 25-28—Tulsa, Oklahoma (*May Hotel*) American Inst. of Chemical Engineers.

Sept. 28-30—Madison, Wisconsin. Wisconsin Section A.W.W.A.

Oct. 2-9—Montivideo, Uruguay (*Hotel Carrasco*) Interamerican Assn. of Sanitary Engineering. Write: J. G. Stewart, Room 2008, 165 Broadway, New York 6, N. Y.

Oct. 3-6—Philadelphia, Pa. Water Pollution Control Federation

Oct. 9-12—Birmingham, Ala. Alabama-Mississippi Section A.W.W.A.

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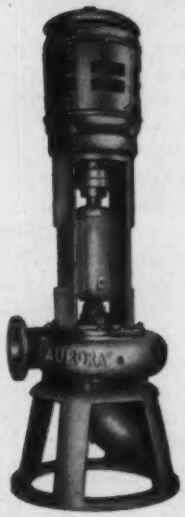

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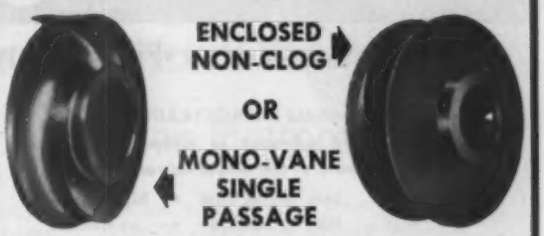
For handling heavy liquids . . . and solids in suspension. Ideal for public utility and industrial wastes.

Capacities to 9000 GPM • Heads to 150 feet • Solids size to 6 inches

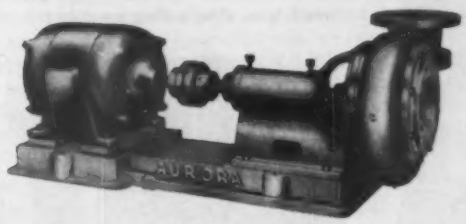
- Easy Installation
- Easy Disassembly
- Smooth—Quiet operation
- Hand cleanout provided in casings
- Detachable suction and packing covers
- Large Passageways
- Many optional features available
- Uniquely balanced impellers
- Engine or combination drives available
- Deep packing boxes

ALTERNATE IMPELLER DESIGN



TYPE KU VERTICAL—For flexible shaft drive... misalignment proof ... elevated motor protection against pit flooding.

TYPE KS VERTICAL SUMP—For heavy duty wet pit service. Complete unit engineered to specific pit requirements.



TYPE KGG HORIZONTAL—Rugged base mounted unit ... for use where suction conditions permit horizontal mounting.

ASK FOR...

MONO-VANE BULLETIN 121MV

NON-CLOG BULLETIN 121A

SUMP BULLETIN 104

AURORA Always PUMPS

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
1020 LOUCKS • AURORA, ILLINOIS

LOCAL DISTRIBUTOR IS LISTED IN THE YELLOW PAGES OF YOUR PHONE BOOK

Equipment News

CONTINUED FROM PAGE 43A

rating, and in a range of sizes from 2 to 12 inches.

The quarter section plug in the new valve has an especially compounded rubber covering for maximum resistance to wear, and the eccentric facing provides a tight resilient seal. Other features include nickel alloy seating surfaces, full pipe area flow openings, wrench or worm gear operation, adjustable stops, open and close indicator, quarter turn operation, few parts, and easy disassembly.

Self-Dumping Trash Rack Rake

521

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has introduced a self-dumping log grapple trash rack rake which retracts its teeth when descending with sufficient space between the rack bars and the teeth on the basket to clear the accumulated trash against the bars.

When ascending, the rake's teeth engage the rack bars to clean the trash

which is then dumped into a car that is carried along the hoist car.

The trash rack rake, available in several models in 6 to 12-ft. sizes in 2-ft increments, is being widely used by power plants and water and sewage works to free water intakes of branches, boxes, tin cans, and other water-borne rubbish.

Utility Truck Bodies

522

Reading Body Works, Inc., Reading, Pa., has developed a new series of streamlined "job-planned" utility truck bodies designed specially for water and sewerage system maintenance. Planned and developed with the cooperation of well-known trucking experts in the field, the new bodies also include structural reinforcement features.

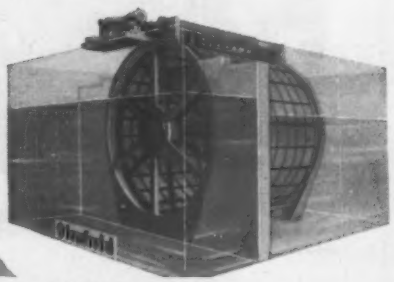
The new units have gracefully turned radius corners at the top of each side compartment. This new feature enhances the appearance of the body, and gives extra durability to the rub rail which protects the sides from damage.

In all 18 utility models, full width cross sills at critical stress points also provide additional rigidity. Twelve-gauge steel is used in the understructure in all Reading bodies which range from a half-ton to one-ton. Bodies are fabricated from 14 to 16-gauge cold rolled steel.

Compartment capacity varies from 35 cubic feet in half-ton models to 68 cubic feet in one-ton bodies. All Reading models feature "file-box"

CONTINUED ON PAGE 104A

microstraining®
Automatic Water Filtration
. . . the Glenfield MICROSTRAINER® is the most unique advance in water filtration. Here are some of the major advantages:
low initial cost • high filtration efficiency • automatic and continuous operation under open gravity conditions • small head loss, eliminating pumping



For information on Microstraining, come to Booth #26—AWWA Convention
GLENFIELD & KENNEDY, INC.
Telephone Kenmyson 5-2552

Congress of Motor Hotels
TRAVEL GUIDE
by BILL ROAMER

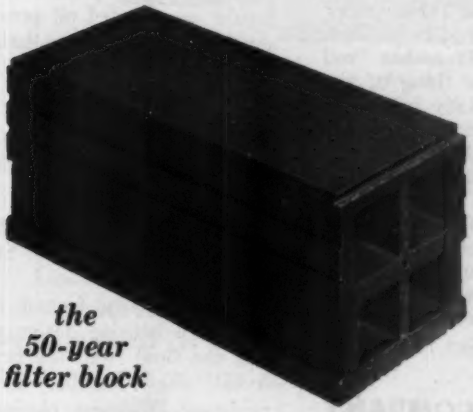
—PALM BEACH SHORES, FLA. Have your dream vacation at the SEASPRAY APARTMENT MOTEL here on famous Singer Island. This lovely motel, right on the beach, offers luxurious accommodations—rooms and apartments with private balcony, air-conditioned and heated. There are phones and TV. Fine swimming pool. Convenient to shops, theatres and restaurants. Credit cards honored.

SEASPRAY
APARTMENT MOTEL
117 Ocean Ave.
(Just E. of Hwy. 703)
PALM BEACH SHORES, FLA.

FREE! Write to this motel for your free copy of the 1959 edition of Congress TRAVEL GUIDE. Lists over 700 fine motels
COAST-TO-COAST
INSPECTED and APPROVED

WILL CORROSION KILL YOUR FILTER BED?

Rust can't form on Leopold Filter Bottoms



the 50-year filter block

The rugged construction and corrosion resistant qualities of Leopold . . . the 50-year glazed tile filter bottoms make them a natural to outlast all others. Made of de-aired fire clay—vitrified and salt-glazed—the blocks can't absorb water, can't rust, can't crumble. Acid and alkali cannot eat into a Leopold block . . . neither can tuberculation form on its smooth finish. Performance-proved in over 500 plants throughout the country, these blocks assure equal filtration and uniform wash distribution. Moreover, the Leopold Filter Bottom needs only a shallow depth of small-sized filter gravel and does not require supporting concrete structures. Write today for the facts and figures.

F. B. LEOPOLD CO., INC.
ZELIENOPLE, PA.

Exclusive Canadian Representative: W. J. Westaway Co., Ltd. Hamilton, Ontario

F. B. LEOPOLD CO., INC.
Zelienople, Pa.

☐ Please send literature on Leopold Glazed Tile Filter Bottoms.
☐ Please send literature on complete line of Leopold products.

Name_____

Affiliation_____

City_____ Zone____ State_____

Use CALGON® TG during the "critical" period—because

TUBERCULATION ACTS FAST

The picture (taken 8 months after main cleaning) shows what happens to water mains during the "critical" period—the first few months after cleaning. The way to prevent this is to make sure that the freshly scored metal is protected *immediately*—and that means Calgon Composition TG, the treatment that forms a protective film *fast*.

The moment bare metal is exposed by cleaning, corrosion starts. The best way to make sure that corrosion of clean metal and in old pits does not get a head start is to get a protective film on the metal immediately. Put Calgon Composition TG right behind the scraper, so that this fast film-forming chemical can beat corrosion to the punch. It will also help disperse the removed corrosion products, making it easier to flush them from the main.

Calgon Composition TG has other benefits, too, when used in continuous treatment. (1) It makes "red water" complaints a thing of the past. (2) It is especially helpful in areas of low flow, and when temperatures go up. (3) Its greater efficiency keeps chemical costs down.

A letter or phone call will bring you more information on how Calgon can help. Or, a Calgon engineer, experienced in controlling water problems of all kinds, will be glad to make detailed recommendations on your specific problem.

CALGON COMPANY
HAGAN BUILDING, PITTSBURGH 30, PA.

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC.

Equipment News

CONTINUED FROM PAGE 102A

convenience in organizing storage of tools, materials, supplies and equipment inside the watertight compartments.

Removable shelf and tray dividers, similar to those in file drawers, plus removable shelves, permit each truck operator to vary the vehicle's interior compartment arrangement to fit daily job requirements. The shelves are mounted on special die-formed steel brackets and can be changed instantly without tools. At the purchaser's option, shelves may be welded permanently in place.

Filter Plant Instrumentation

523

The Penn Instruments Div. Burgess-Manning Co., Philadelphia, Pa., has announced new instrumentation for filter plant operation. Their rate of flow controller, head loss gage and large-dial wash water indicator are a new application of standard Burgess-Manning instruments and venturis.

A few of the unique features include dial setting of rate of flow at the control panel as well as manual or automatic selection, stainless steel venturis, elimination of hydraulic piping to the control station, easily adapted for modernizing existing installations as well as new construction. The valve operator van be hydraulic or a sealed oil pressure system with minimal installation space.

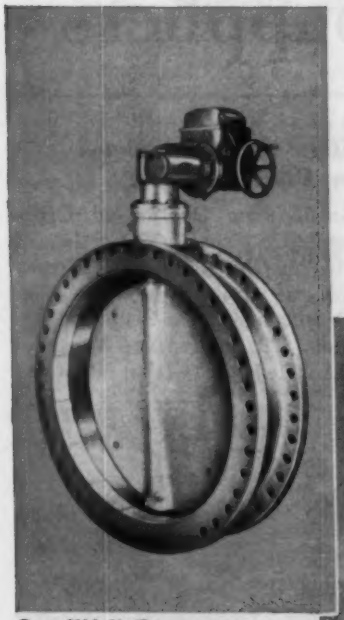
Two Stage Turbine Type Pumps

524

Aurora Pump Div., New York Air Brake Company, Aurora, Ill., has announced important new design changes on the Apco Two-Stage Turbine Type Pumps.

The major new feature is the revised shell housing design which directs the fluid from the first to the second stage impeller in a 180° cross-over. By thus placing in opposition the resultant forces of first and second stages, the forces are equalized and a condition of balanced radial loads is achieved. At the same time the arrangement eliminates shaft deflection.

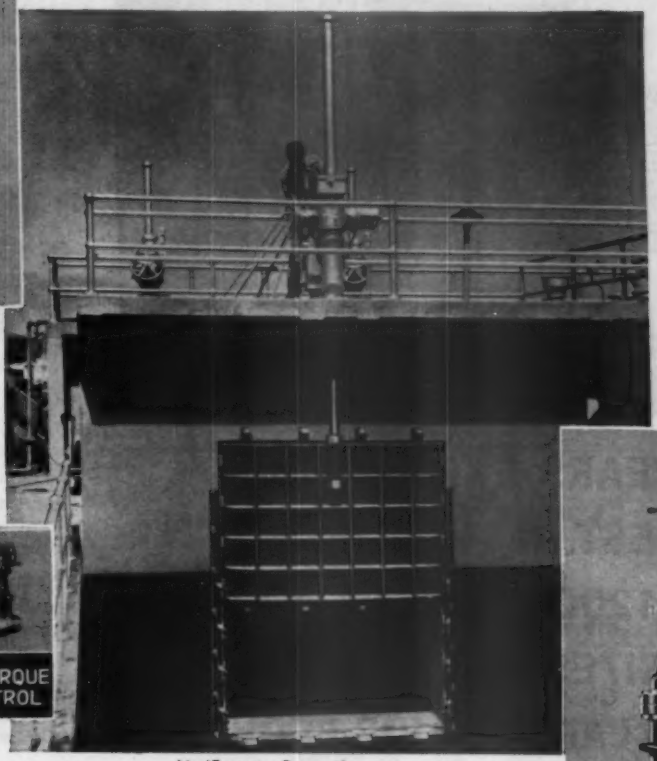
THERE IS NO SUBSTITUTE FOR LimiTorque



Type SMA LimiTorque operating a Henry Pratt Company 48" Butterfly Valve.

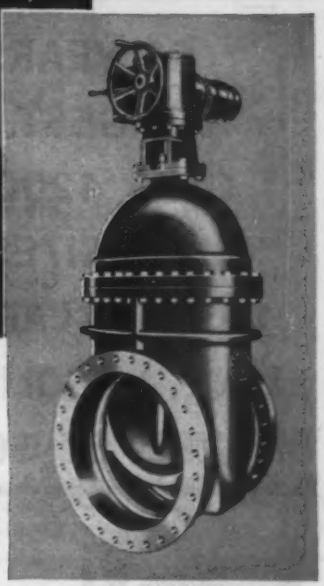
Yes! there is no substitute for LimiTorque. More engineers are recognizing this daily. A recent specification, from which we quote, "The motor operated valve shall be of the Philadelphia 'LimiTorque' type or full equal. Because this type has been proven in service similar to that for which this valve will be used and because of unsatisfactory results with other operators" . . . recognized the superiority of LimiTorque Valve Controls.

Why don't you specify LimiTorque?



LimiTorque Operating an 84"x60" Armco Sluice Gate.

For the full story on LimiTorque's time and money-saving features, write for Complete Catalog #L-550.



Type SMA LimiTorque operating a 30" A. P. Smith Co. Gate Valve.

LimiTorque has acceptance around the world being used widely in most every industry such as, Power, Chemical, Petroleum, Petro-Chemical, Pipelines, Water, Sewage, Marine, Aircraft and Missile. LimiTorque can be depended upon to operate your valves under the most adverse climatic or operational difficulties.

LimiTorque Controls can be field mounted on existing valves—contact your valve manufacturer, or our nearest sales engineering office.

See Us at Booths 134 & 135. National AWWA Convention, Miami, Florida

THERE IS NO SUBSTITUTE FOR

LimiTorque®

PHILADELPHIA GEAR CORPORATION

KING OF PRUSSIA (SUBURBAN PHILADELPHIA), PA.

Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • King of Prussia, Penna.

This Ejector Warranty Puts a Solid Base Under Your Specifications

63 YEARS EXPERIENCE, LONGEST IN THE FIELD... OVER 4200 INSTALLATIONS ...212 SIZES AND TYPES, THE WORLD'S LARGEST JOB-PROVED LINE...A SOLID PRODUCT THAT'S BACKED BY SOLID ENGINEERING!

E-6029

YEOMANS®

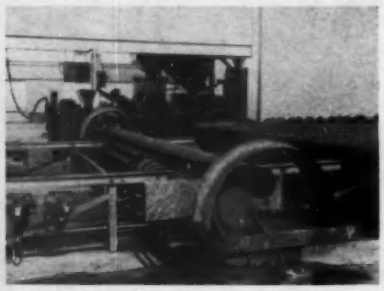
1999-9 North Ruby Street
Melrose Park, Illinois

This is the SHONE® with mechanical controls. It is the *original* pneumatic ejector. The first SHONE® was installed in 1870.

News of Suppliers

Griffin Pipe Completes New Plant

Griffin Pipe Division of Griffin Wheel Co., Council Bluffs, Ia., recently announced that its Council Bluffs' cast iron pressure pipe plant has been completed and is in full production. The opening of the plant marks the entry of Griffin into a new



field. Griffin's other principal product line is freight car wheels for railroads. Conversion of the plant into a modern pipe producing facility was begun in April, 1959.

The Council Bluffs plant consists of 95,000 square feet of buildings on 19 acres of land with a separate office building. The site is served by nine railroads and truck carriers.

Including the pipe plant, Griffin operates 11 plants in the United States and Canada, and has a research center at Bensenville, Illinois.

Peerless Pump Division Has New Name

The Food Machinery and Chemical Corporation, San Jose, Calif., has announced that its Peerless Pump Division, with headquarters in Los Angeles, and seven associated operations involved in pump manufacturing and allied fields, will operate under the new organizational name: Hydrodynamics Division.

Under the new divisional name, all individual operations will retain their separate identity through products line designations. These are: Peerless Pump, Chicago Pump, Coffin Turbo Pump, Mechanical Foundries,

CONTINUED ON PAGE 110A

NOTE THE NUMBERS

they correspond with the

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Gentlemen:

Please enter my subscription to WATER & SEWAGE WORKS for the period checked below:

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No Postage Stamp Necessary If Mailed in the United States

Postage Will Be Paid by Addressee

BUSINESS REPLY MAIL
First Class Permit No. 43608, Sec. 34.9, P.L.&R., Chicago, Ill.

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185 NORTH WABASH AVENUE
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WATER & SEWAGE WORKS
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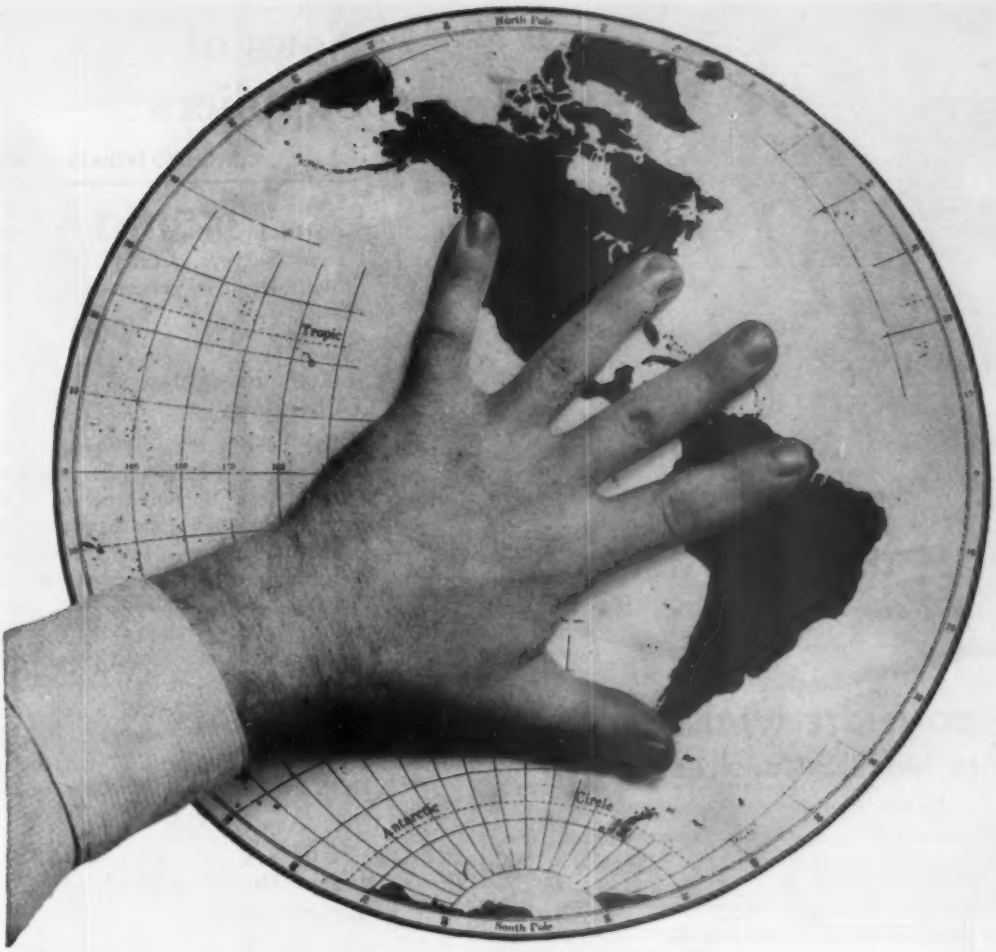
WATER & SEWAGE WORKS



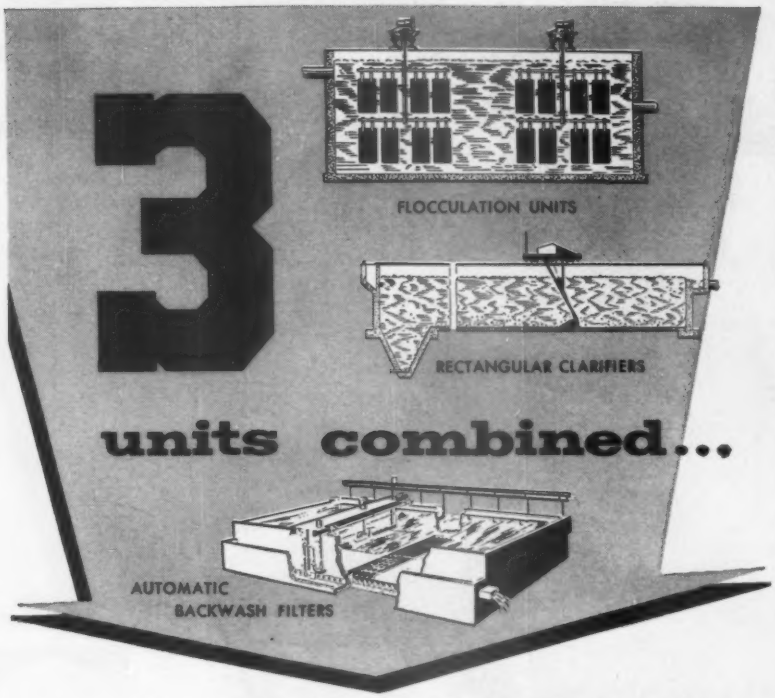
SPANNING THE AMERICAS...

Roberts Filter Manufacturing Company has been complementing the engineering profession in supplying water purification equipment to Municipalities and Industry for over 60 years.

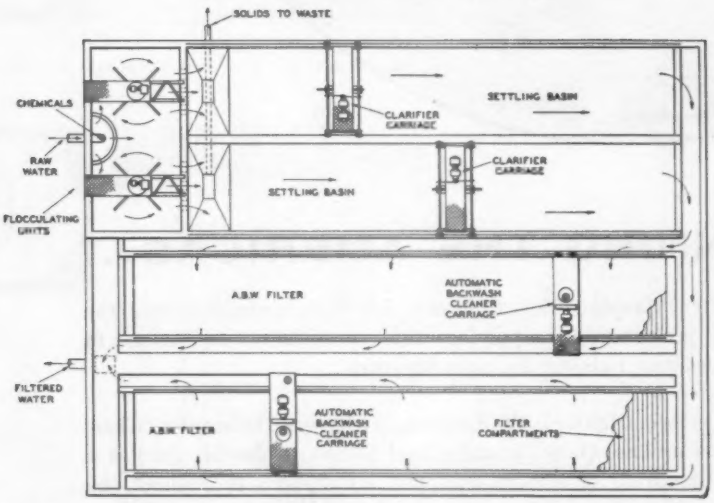
Montreal, Quebec; Hanford, Washington; Sheboygan, Wisconsin; Charlotte, North Carolina; Quito, Ecuador, and Bogota, Colombia are just a few of the hundreds of Roberts-equipped installations throughout the United States, Canada, and Latin America.

The Roberts nameplate is the assurance of dependable trouble-free service, quality of materials and pride of workmanship.

the nameplate of dependability



. . . for COMPLETE WATER TREATMENT in ModularConstruction



For industrial or municipal water supplies, the Hardinge equipped water treatment plant is available in unit sizes of from 1 M.G.D. to 5 M.G.D. Flocculation, clarification, and filtration equipment — combined in modular units and sized to your requirements for a continuous supply of high-quality water. Can be furnished complete with automatic plant controls.

Write for full details.

HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 Arch St. • Main Office and Works

New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco • Birmingham • Lakeland

News of Suppliers

CONTINUED FROM PAGE 106A

Sonith Foundries, Laval Underground Surveys, Varley-FMC Ltd. (England), and Peerless-Tisa, S. A. (Mexico).

Jeffrey Promotes Ambrosiana

The Jeffrey Manufacturing Company of Columbus, Ohio, has announced the appointment of Mr. Peter Ambrosiani as manager of the Western Territory, Mining Division. Mr. Ambrosiani's long experience in the coal mining fields of West Virginia, Kentucky and Pennsylvania, among other qualities, mark his qualifications for this new position.

He will service Jeffrey business in the Western trading area and will have his offices at the E. C. Horne Machinery Company, Denver, Colorado.

Brown Receives Beckman Appointment

Beckman Instruments, Inc., Fullerton, Calif., has disclosed the appointment of Roy F. Brown as Marketing Manager of the Scientific and Process Instruments Divisions. In his new position, Brown will direct the marketing of the Division's products, which include analytical instrumentation for scientific laboratories, medical research, and industrial process control.

In 1956, Brown joined Beckman as Eastern Regional Manager for Process Instruments, operating from Mountainside, New Jersey. He was transferred to the Division's Fullerton, California, headquarters in 1958 as Field Sales Manager for Process Instruments. In 1959 He was appointed process Sales Manager for the entire Division.

Brown, who is a licensed profes-

CONTINUED ON PAGE 112A

Twin HEATX units provide automatic digester temperature control plus building heat, at Aurora Sanitary District's recently expanded plant, Aurora, Illinois. These 500,000 BTU/hr. units include automatic fuel make-up with natural gas when digester gas pressure is low.

Walter E. Deuchler Co., Aurora, Illinois – Consulting Engineers
W. A. Sperry – Superintendent Aurora Sanitary District

Automatic digester temperature control ■ 180°Boiler heat for building heat

HEATX

140°Exchanger temperature prevents sludge caking
Adaptable to waste heat utilization
Exclusive rifled sludge return bend castings

Maximum efficiency using digester gas and/or natural gas or fuel oil

The Walker Process HEATX provides the *complete unit* for your digester sludge heating process. Concentric tube heat exchanger, fire tube boiler and control panel are combined to give absolute control over each function. Exclusive ***rifled*** sludge return bend castings cause sludge to spiral through the exchanger tubes – better K value – wall scouring prevents slime and grease adhesion. ■ The HEATX is available in standard sizes ranging from 100,000 to 2 million BTU/hr. output. Bulletin 24 S82 gives complete description of type EB (with boiler) and type E (without boiler)

WALKER PROCESS

WALKER PROCESS EQUIPMENT INC.
FACTORY • ENGINEERING OFFICES • LABORATORIES
AURORA, ILLINOIS

For frequent operation in inaccessible locations...

specify DARLING cylinder-operated GATE VALVES

Here's a valve that's as versatile as you want to make it. It can be readily adapted to your piping conditions or process cycles. For example:

Manual or Automatic Operation may be used—by means of four-way valves which control the flow of fluid or air to the cylinders.

Air, Oil or Water may be used for the operating media—and can be piped from the lines on which the valves are installed.

Engineered for Your Application—Valves can be supplied, piped and equipped with solenoid or pilot-operated control valves, limit switches and positioners for remote or local operation.

Write for detailed information or quotes, giving size of valves required, kind of valves (Iron Body Bronze Mounted, All-Iron, Bronze, Special Alloy, etc.), service conditions, maximum disc pressure and minimum cylinder pressure.

DARLING VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 11, Pa.

Manufactured in Canada by Canada Valve & Hydrant Co., Ltd., Brantford, Ont.

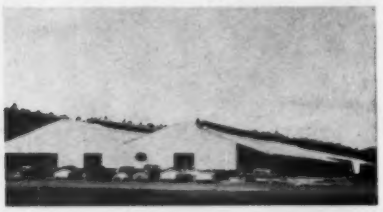
News of Suppliers

CONTINUED FROM PAGE 110A

sional engineer in New York, is a member of the Instrument Society of America, American Society of Mechanical Engineers, American Management Association, and National Sales Executives Club.

Dickey Builds New Clay Pipe Plant

W. S. Dickey Clay Mfg. Co., Kansas City, Missouri, has revealed that a huge tunnel kiln is the first unit scheduled for completion at their new, ultra-modern Birmingham-Bessemer, Alabama, plant.



Constructed of steel and refractory brick, the kiln will be housed in one wing of the 820-foot building shown above. Green clay pipe, loaded on 12-foot-wide flat cars, will travel slowly along the 575-foot length of the kiln, passing through various heat zones. The kiln is 16 feet wide and up to 16 feet high.

The new kiln was designed to vitrify clay pipe in sizes up to 24 inches in diameter. Future plans call for the construction of a companion unit.

Consolidation Move Made by Pittsburgh Coke & Chemical

Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., has consolidated its three chemical divisions in a new, wholly-owned subsidiary company. Named Pittsburgh Chemical Company, the new subsidiary will bring together the parent company's Activated Carbon, Protective Coatings and Industrial Chemicals Divisions, and supporting chemical group staff departments.

Sales of Pittsburgh Chemical Com-

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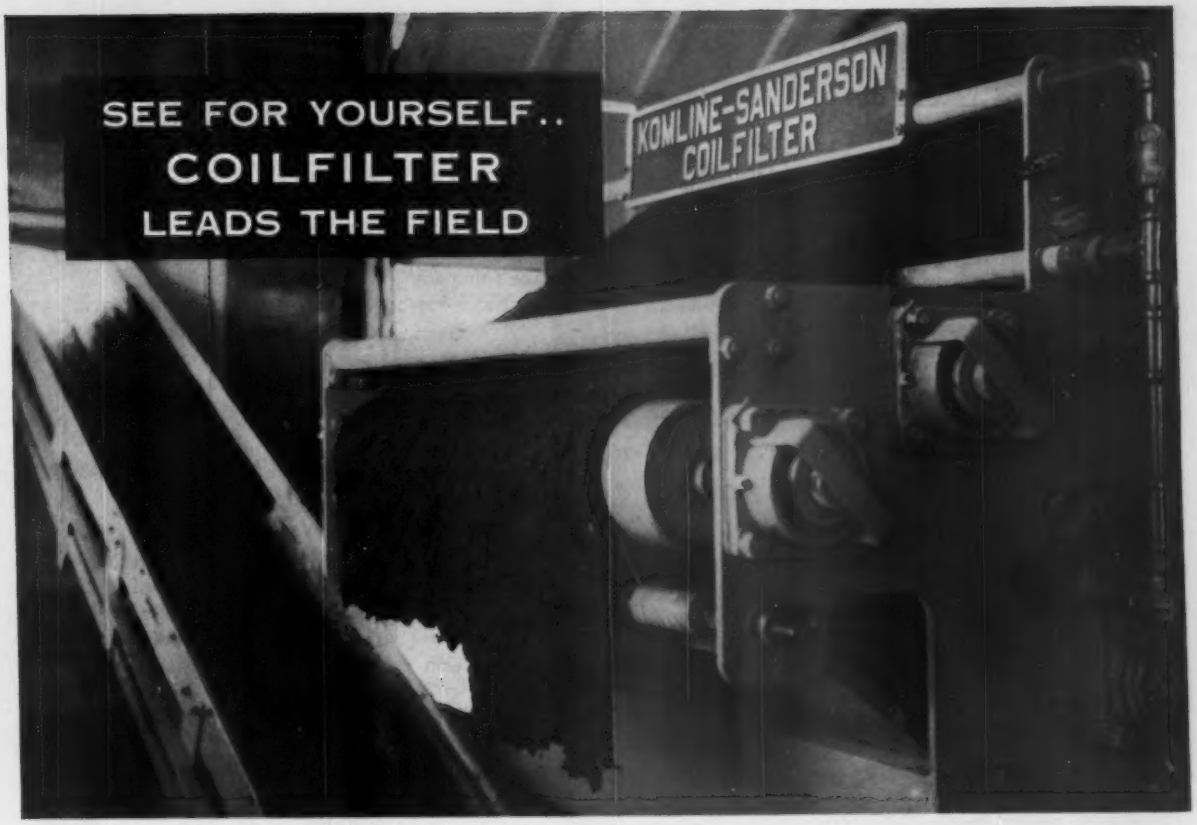


Illustrated above: Cozad, Neb., plant. Engineers: Nesky & Hickey

SEND FOR THIS COILFILTER INSTALLATION LIST

Bulletin No. 109

Exaggerated claims by others notwithstanding, the fact remains that there are more Komline-Sanderson COILFILTERS in trouble-free operation than any other sludge dewatering device. COILFILTER success is based upon performance, not claims. This performance is shown in readily available plant operating data. Each installation, more than anything written, proves COILFILTER superiority.

WHY? Because the basic COILFILTER design provides for a truly non-clogging, rugged permanent filter media—a design established by engineers conversant with operating problems encountered in sewage sludge dewatering.

We want you to see COILFILTER superiority for yourself. Send for the eight page list of COILFILTER installations. There is probably an installation near you. We will be glad to have a K-S representative show you COILFILTER'S many outstanding features.

KOMLINE-SANDERSON
ENGINEERING CORPORATION
PEAPACK, NEW JERSEY
BRAMPTON, ONTARIO, CANADA

News of Suppliers

CONTINUED FROM PAGE 112A

pany are expected to account for nearly one-third of Pittsburgh Coke's sales in 1960, and the subsidiary plans to spend approximately $7 million for plant expansions this year.

Property has been acquired and plans will shortly be announced for the construction of a new Pittsburgh Chemical Company plant in the Ohio River Valley near Ashland, Kentucky.

The organization of the Pittsburgh Chemical Company will be patterned after Pittsburgh Coke's former chemical group, and will utilize the same personnel and plant facilities.

Ernest Cummings Named Field Engineer

Denison Engineering Division, American Brake Show Company, Columbus, Ohio, recently announced that Ernest W. Cummings has been named Field Engineer.

Mr. Cummings will be located in Pittsburgh, Pennsylvania for the sale of hydraulic pumps, motors and controls in the Western Pennsylvania and West Virginia area.

A 1951 graduate of the University of Washington with a degree in business administration, he was previously associated with the Trane Company of LaCrosse, Wisconsin, as Sales Engineer.

Siefers Receives Byers' Appointment

A. M. Byers Company, Pittsburgh, Pa., has appointed H. K. Siefers, Jr. as manager of their Engineering Service Department.

Mr. Siefer joined the Byers Company in 1956, serving in the Engineering Department. He was previously associated with Hall Laboratory, division of Hagan Chemicals and Controls, as an engineer.

A graduate of Carnegie Institute of Technology with a degree in Chemical Engineering, Mr. Siefers is a member of the National Association of Corrosion Engineers.

Peerless Pump Names Nommensen to Sales Post

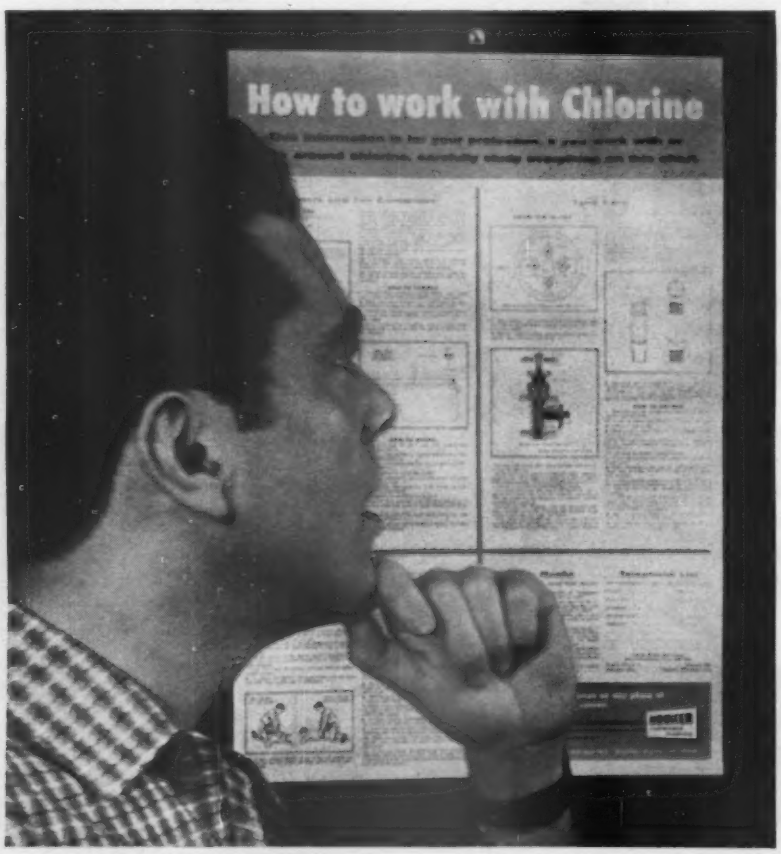
Peerless Pump, Food Machinery and Chemical Corporation, Los Angeles, Calif., has announced the appointment of John D. (Jack) Nommensen as Process Pump Product sales manager, of the Peerless Pump, Hydrodynamics Division.

Nommensen served as a sales engineer for the past five years in the Michigan area and his most recent post was that of branch manager of the Peerless Detroit office.

Hooker Chemical Moves N.Y. Office

Hooker Chemical Corporation, New York, N. Y., has announced the recent address change of their Corporate Headquarters, New York District Sales Offices, and Export Sales Department. Their new address is: 666 Fifth Avenue, New York, N. Y.

The headquarters of the firm's Eastern Chemical, Western Chemical, Durez Plastics and Phosphorus Divisions will remain at their present locations.



YOU CAN'T BE COMPLACENT ABOUT SAFETY

Workmen can pass a safety chart a dozen times a day. You can plaster work areas with signs and slogans. Yet a lapse of attention, a moment's carelessness, and there might be trouble.

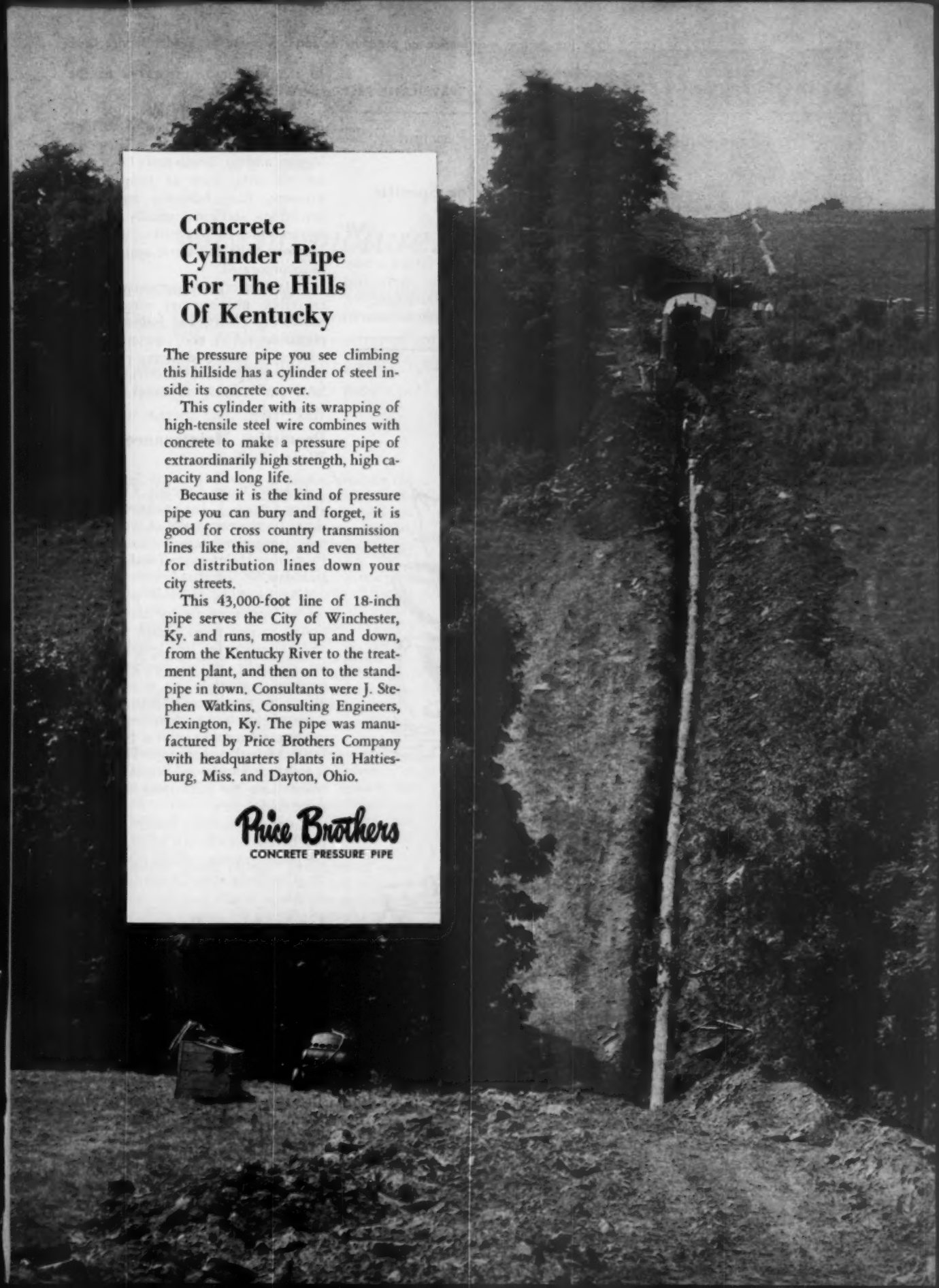
When dealing with potentially hazardous chemicals, correct procedures cannot be overemphasized. This is why we supply safety charts . . . and write books like our 76-page chlorine manual. If you need more charts and would like a copy of the chlorine book, please let us know.

HOOKER CHEMICAL CORPORATION
1705 UNION STREET
NIAGARA FALLS, N.Y.

HOOKER CHEMICALS PLASTICS

Sales Offices: Buffalo, Chicago, Detroit, Los Angeles, New York, Niagara Falls, Philadelphia, Tacoma, Worcester, Mass.

In Canada: Hooker Chemicals Limited, North Vancouver, B. C.



Concrete Cylinder Pipe For The Hills Of Kentucky

The pressure pipe you see climbing this hillside has a cylinder of steel inside its concrete cover.

This cylinder with its wrapping of high-tensile steel wire combines with concrete to make a pressure pipe of extraordinarily high strength, high capacity and long life.

Because it is the kind of pressure pipe you can bury and forget, it is good for cross country transmission lines like this one, and even better for distribution lines down your city streets.

This 43,000-foot line of 18-inch pipe serves the City of Winchester, Ky. and runs, mostly up and down, from the Kentucky River to the treatment plant, and then on to the standpipe in town. Consultants were J. Stephen Watkins, Consulting Engineers, Lexington, Ky. The pipe was manufactured by Price Brothers Company with headquarters plants in Hattiesburg, Miss. and Dayton, Ohio.

Price Brothers
CONCRETE PRESSURE PIPE

New Bulletins

AVAILABLE FREE

Water Treatment Equipment

525

Hardinge Company, York, Pa., has available recent literature describing their complete water treating plant which includes, in one common wall unit, flocculation, clarification, and filtration equipment.

The release illustrates the equipment with pictures and an installation diagram. Also available is a bulletin describing the company's flocculation units.

Data Loggers For Specific Requirements

526

Hanson-Gorrill-Brian, Inc., Glen Cove, New York, have issued a new brochure describing their diversified Date-Master line of Data-Loggers, which are designed and built, tailored to the specific requirements of the user.

The new brochure describes the features of Data-Masters of various sizes and capacities, from 50-point loggers and up. These units log a variety of data, such as temperature, pressure, flow, humidity and other conditions, and automatically prepare a typewritten or punched tape record. Memory units and alarm systems can be incorporated.

Data-Masters are currently in use in public utilities and waterworks, processing plants, and industrial applications where the continuous recording of data from many points at one central location is solving problems and helping to effect savings for users.

Protective Maintenance For Water Industry

527

Joseph Dixon Crucible Company, Jersey City, N.J., has published a brochure on the economics of water system protection called "Engineered Protective Maintenance for the Water Industry."

The brochure outlines paint and primer specifications for the protection of various types of tank interiors and exteriors, for fire hydrants and for pumping station equipment. It contains a chart which reveals at a glance the number of gallons of paint required for tanks of various sizes, ranging from tanks with a 50,000 to 1,500,000 gallon capacity. The chart is based on engineered drawings combined with the experience of many paint contractors.

Another unusual feature of the brochure is an editorial which stresses the public relations values represented by attractively coated municipal water works.

Ion-Exchange Resins and Celluloses

528

BIO-RAD Laboratories, Richmond, Calif., have issued their new catalog that combines working data on the company's line of ion-exchange materials with pricing and ordering information. In addition, details are included explaining the special custom services that are available, and on resin selection and application.

The materials covered in the catalog include: Anion-Exchange Resins; Cation-Exchange Resins; Mixed-Bed Resins; Amino-Acid Resins;

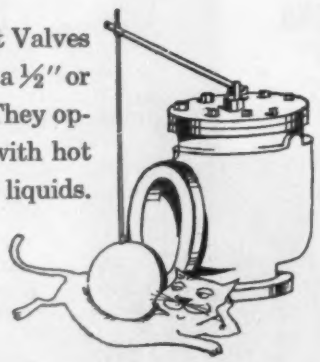
CONTINUED ON PAGE 118A

LIQUID LEVEL CONTROL

G-A *Cushioned* Float Valve

Sensitive Golden-Anderson Float Valves automatically hold water level to a ½" or 1" variation in tanks, bins, etc. They operate at high or low pressure—with hot or cold water—and most other liquids.

Bulletin W-5A has all the facts.



GOLDEN ANDERSON Valve Specialty Company

1255 RIDGE AVENUE, PITTSBURGH 33, PA.

Designers and Manufacturers of VALVES FOR AUTOMATION

why no picture?

A picture can be deceiving. Almost all plastic pipe looks the same . . . and even looks like metal pipe. The difference is a matter of time . . . and piping that goes wrong can be mighty expensive for a water works manager. A picture means nothing . . . but . . .

There are scores of brands of plastic pipe on the market . . . made of a dozen different materials . . . wonderfully improved over the early plastics. All are labeled "rust resistant" . . . but total results may be good, bad, or indifferent depending on your choice. Here's what to look for:

The universal material? No such thing. No one plastic (no *metal*, for that matter) can handle *all* liquids . . . no one has all the properties required of a truly universal pipe. Closest to it are Ace Riviclor (Rigid PVC) and Ace-Ite (ABS rubber-plastic blend). Riviclor is a little better on chemical resistance, and Ace-Ite is a little better on impact strength and heat resistance. Both are OK for drinking water and also for chemicals used in treating water. Of course they're immune to rust, rot, soil and electrolytic corrosion. And they both cost about the same.

Are plastics fully approved for drinking water? Yes . . . the National Sanitation Foundation at University of Michigan attest with their seal that they regularly test Ace Riviclor, Ace-Ite, Ace Supplex and certain of our other brands of plastic pipe, and certify them non-toxic. These materials are odorless and tasteless as well as non-toxic.

Are plastics strong enough? Hundreds of water works and thousands of chemical plants (all very critical people) say *yes!* Plastic pipe is now available in several wall thicknesses for working pressures to 490 psi. It takes plenty of hard knocks, and resists accidental cutting and damage quite satisfactorily.

Where do I use it? Ace-Ite and Riviclor have been used with wide success for years in water and sewage works for feeding a host of treatment and regenerating chemicals . . . chlorine, alum, ferrous sulfate, ferric chloride, etc. They outlast ordinary metals many times over, at prices much lower than special metals.

Greatest future use is in service lines and small water mains, now under extensive study. We've supplied miles of pipe for successful installations. If you haven't yet put some underground for test, it's time to start. Nothing takes the place of *personal* experience. (Also, try Ace Supplex flexible polyethylene for temporary lines.)

How can I dodge the pitfalls of "trial and error?" Go to a company that has no axe to grind . . . a company with the widest experience in water works problems. We, for instance, supply seven different kinds of pipe for water and sewage works . . . with fittings and valves to match. And we've always supplied the industry with a high percentage of the precision hard rubber water meter parts, rubber-lined ion-exchange tanks, molded chlorinator parts, rubber-lined intake lines, and chemical pumps now in use. For truly unbiased advice . . . backed by 100 years of experience . . . and prices as low as you'll find anywhere . . . come to American Hard Rubber Company.

Free Selector Charts. 20 valuable pages . . . comparable properties, chemical resistance, costs, etc., of 11 plastics and rubber materials. **Write today for Technical Bulletin CE-50W.**

Ace-Ite®, Ace Riviclor® and Ace Supplex® are approved for drinking water.

ACE RUBBER & PLASTICS EQUIPMENT
BY AMERICAN HARD RUBBER COMPANY
DIVISION OF AMERACE CORPORATION
ACE ROAD • BUTLER, N. J.

New Bulletins

CONTINUED FROM PAGE 116A

special resins such as Chelating, Zwitterion, Carboxylic, Phosphonous, Phosphonic, and Polyamine; and Ion-Exchange Celluloses.

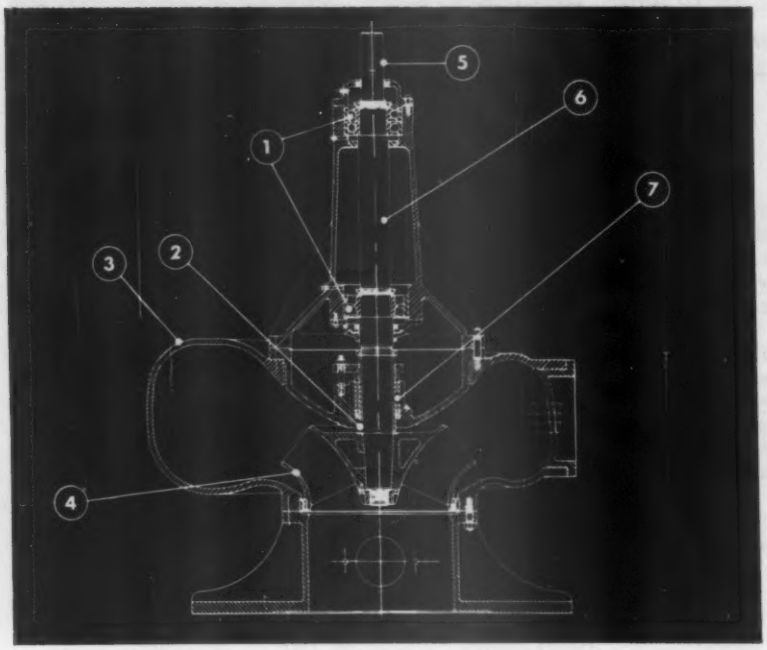
The catalog also contains a bibliography.

Stainless Steel Tubing

529

Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., is now distributing a new, 34-page booklet that provides the details of the various sizes, grades, design data, corrosion resistance, and other pertinent information on both welded and seamless stainless steel tubing.

More than 25 tables covering many aspects of this type of tubing are included, along with photographs and other illustrations and data. The publication also contains a special section on composite tubing.



Which features are biggest down-time savers in big sewage pumping jobs?

Wheeler-Economy says these features of its Mixed Flow Volute Pumps will be on anyone's list. See if you don't agree.

1. BALL AND ROLLER BEARINGS with heavy-duty thrust bearing located atop bearing bracket.

2. EASILY-ACCESSIBLE ROTOR reduces down-time for maintenance.

3. HIGH-STRENGTH CASING is close-grained cast iron. Steel or special alloys furnished to meet special conditions.

4. IMPELLER is bronze, cast iron or alloy suitable for the service. Wearing Rings are easily renewable.

5. FLEXIBLE COUPLING is located between the Pump and the Motor.

6. HEAT-TREATED ALLOY STEEL SHAFT is extra large for added strength and is precision ground and polished.

7. STUFFING BOX is unusually deep to hold adequate packing and is easily accessible for replacing packing. It can be fitted with cage or lantern ring for flushing when pumping gritty liquids.

8. VERTICAL OR HORIZONTAL mounting can be furnished.

Write for Catalog F-102, for complete information on sewage pumps with 3000-150,000 gpm. capacities

Economy Pump Division

C. H. WHEELER MFG. CO.

19th and Lehigh Avenue • Philadelphia 32, Pa.

Whenever you see the name C. H. Wheeler on a product, you know it's a quality product

Centrifugal, Axial and Mixed Flow Pumps • Steam Condensers • Steam Jet Vacuum Equipment • Marine Auxiliary Machinery • Nuclear Components

Motor Control Centers Are Automatic

530

Automatic Control Company, St. Paul, Minn., has published a 16-page bulletin describing their line of Autocon Plan-Pak Motor Control Centers which is available in three distinct designs. The units may be used with municipal water supply and other sewage, sewage and drainage systems.

Illustrated construction details, typical layouts and methods of figuring equipment combinations are included in the bulletin. Also included is a suggested specifications sheet and on-the-job pictures.

Motorized Valve Actuators

531

Helitork, Division of The Earle Gear and Machine Company, Philadelphia, Pa., is offering an 8-page, technical bulletin that gives the details of its Series EG motorized valve actuators.

Cutaway drawings and diagrams show the construction and operational features. Each principal component is described separately and its operational function explained. Performance data and ordering information are also included.

Chemical Feed Pumps

532

American Meter Company, Pump Division, Philadelphia, Pa., has just published their new catalog which provides detailed information on their Series 200 controlled capacity chemical feed pumps. Data on the design, construction of both Simplex and Duplex models is included.

With a repetitive metering accuracy of $\pm 1\%$, these pumps are especially suitable for moving specific volumes of fluid into high and low pressure systems.

Flow Rates Adjust Pumps Stroke Automatically

533

Milton Roy Company, Philadelphia, Pa., is offering its recently published data sheet, D-59-1, which explains how controlled volume pumps solved the problem of metering a softening agent into the distribution lines at the two pumping stations serving Ft Bliss, Texas.

By incorporating an automatic stroke length adjustment which re-

CONTINUED ON PAGE 120A

Newport News rack rakes . . . minimum-manpower way to keep water intakes free of debris

Newport News mechanical rack rakes are power-operated rakes for cleaning trash racks at water intakes, including those at hydro-electric plants, steam plants, pumping stations, and similar installations throughout this country and abroad. Under ordinary conditions, one man per shift keeps racks clean for a dozen bays.

Operate in channel guides for maximum cleaning action

A Newport News rake *won't ride over trash* nor will its teeth drop the debris, because the rake operates in channel guides for positive action. Special teeth are available for cleaning racks of filamentous algae, seaweed, etc.

The Newport News mechanical rack rake has been built to operate in bays from 5 feet 6 inches wide to 28 feet 6 inches in width. Forebay design determines the maximum width for a single rake. In the case of a very wide bay, intermediate guides are sometimes used to reduce the length of the rake. There are many typical installation arrangements to fit your needs. Newport News engineers are prepared to individualize these designs for you.

If you have a debris problem, write for a copy of THE NEWPORT NEWS MECHANICAL RACK RAKE, an illustrated booklet describing the installation, operation, and advantages of a Newport News rake.

Engineers . . . Desirable positions available at Newport News for Designers and Engineers in many categories. Address inquiries to Employment Manager.

Newport News
Shipbuilding and Dry Dock Company
Newport News, Virginia

New Bulletins

CONTINUED FROM PAGE 118A

sponds to changes in flow rates, the manufacturers of the pump insure a consistent and automatic ratio of phosphate to water with varying water pumping rates.

Natural Gas Engines Booklet

534

Caterpillar Tractor Co., Engine Division, Peoria, Ill., has issued an 8-page booklet that describes their complete line of Natural Gas Engines for all applications.

The booklet traces the development of the natural gas engine at Caterpillar; shows model views, specifications and fuel consumption curves of the current models.

In addition, the publication includes photographs and job stories illustrating actual performance of the company's Natural Gas Engines in irrigation, pipeline, air conditioning, sewage disposal, and standby installations.

Condensed Catalog on Electrode Controls

535

Charles F. Warrick Co., Berkley, Mich., has just published a new 4-page condensed catalog covering their floatless electrode-type Liquid Level Controls.

Basic information, illustrations, diagrams and charts are included so that the user will be able to find most of the necessary material he requires.

Included in the new catalog are: an explanation of the principle of operation; a detailed description of both the 2- and 3-pole Controls and Enclosures; essential information on Multiple Pump Controls and Special Control Panels; and data on Warrick Electrode Fittings and Electrodes.

Clarifiers for Water and Waste Treatment

536

Lakeside Engineering Corp., Chicago, Ill., have published a 34-page bulletin that provides comprehensive information on the design, construction, and operation of their Spiraflo clarifiers used for water supply and waste treatment.

The text is augmented by many diagrams, tables, charts and other drawings, as well as on-the-job photographs. Information is also provided to help the user specify or design a Spiraflo clarifier for his particular application.

Corrugated Metal Sewer Pipe

537

Republic Steel Corporation, Cleveland, have announced the availability of their new, 4-page folder that discribes the company's Free Flow sewer pipe, which features an interior lining of smooth asphalt. The exterior of the pipe is constructed of riveted, corrugated, metal.

Included in the bulletin are descriptions and guide specifications for Free Flow pipe made from either copper steel of from asbestos zinc-clad culvert sheets. Pictures of the material and tables showing the relationship between sewer loading and gauges of metal pipe are also presented.

CONTINUED ON PAGE 122A

SAN DIEGO COUNTY *chose* STEEL PIPE

In 1959 the Second San Diego Aqueduct was constructed for the San Diego County Water Authority. This 30 mile line running over hill and dale, required rugged 76 in. and 73 in. welded steel pipe ranging in wall thickness from 3/8 in. up to and including 1-5/32 in. All pipe was in 32 ft. lengths with a spun mortar lining and an exterior mortar coating.

This 30 mile steel pipe line was laid by Young & Anderson Company, Brea, California.

. . . every length was hydrostatically tested in the shop to AWWA standards!

STRENGTH
TIGHTNESS
ELASTICITY
ECONOMY
LONG LIFE

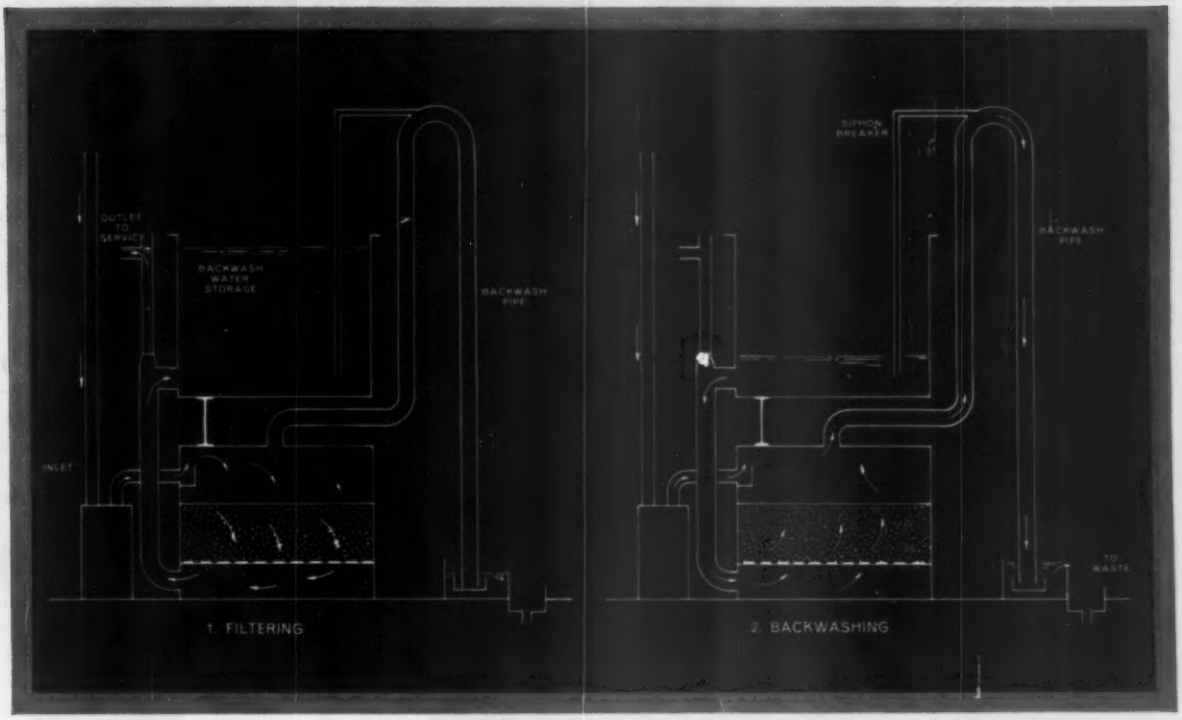
. . . these are inherent qualities of fabricated *steel* pipe. Compare *steel* pipe with other types . . . you'll see why "wherever water flows, steel pipes it best." You can always specify *steel* pipe with confidence.

For your copy of the latest steel pipe brochure, write—

STEEL PLATE FABRICATORS ASSOCIATION
105 West Madison Street • Chicago 2, Illinois

STEEL PLATE FABRICATORS ASSOCIATION Founded 1933

FLUIDICS* AT WORK



How this valveless filter can save you up to 45% on initial cost, even more on operations

Even though it costs up to 45% less than conventional gravity filters, this Permutit Automatic Valveless Filter gives you your biggest savings *after* you install it.

Every day it operates, it racks up husky savings because of the steps and equipment you don't need.

The diagram here shows you how the valveless filter works. During filtering, loss of head causes water to gradually rise in backwash pipe. When it reaches 4-5 ft. above the backwash storage level, it starts a siphon action. This lowers pressure above the sand bed, reversing the water flow, and backwashing begins. Backwash continues until the level in the backwash water storage tank falls below the end of the siphon breaker. Then the siphon is broken, and the filter automatically rinses and returns to its filtering cycle.

All done automatically without a single valve, agitator, gauge, pump, flow controller—or even an operator.

No moving parts. No wear to cause maintenance other than routine painting.

Labor costs: nil.

Instrumentation: zero.

Auxiliary equipment: none.

You even save money on installation. Up to 10′ diameter, we ship the valveless filter all set up. You just place it and install the piping.

For details, write our Permutit Div., Dept. PW-50, 50 West 44th St., New York 36, N. Y., for Bulletin 4351. In Canada: Permutit Co. of Canada, Ltd., 207 Queens Quay West, Toronto 1, Ont.

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . . the science of fluid processes

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

New Bulletins

CONTINUED FROM PAGE 120A

Hollow Shaft Pump Motors

538

U. S. Electrical Motors, Inc., Los Angeles, Calif., is offering a 16-page bulletin presenting the details of its Holloshaft pump motors specifically designed for outdoor service.

Cutaway drawings of the equipment, fully colored to show all interior components, are featured. These drawings and other illustrations including many pictures show the various operational and construction pump features. Most of the main components are discussed separately and have complementary graphic coverage.

Single Control Valve

539

Graver Water Conditioning Co., New York, N.Y., has issued a 4-page bulletin that outlines the main features of its Monotrol, a new, single control valve for zeolite softeners, ion exchange units and filters.

The bulletin discusses design, operation and construction details of this cast iron unit and the exclusive all-plastic unit for corrosive service. Among the features covered are the pilot control, the hydraulic pressure actuation, and the provision for no leakage and low pressure loss.

Schematic drawings of flow are included; also a guide to valve construction for the various corrosive and non-corrosive services.

Corrosion Resistance Chart

540

OPW-Jordan Corporation, Cincinnati, Ohio, is offering a new, 4-page corrosion-resistance chart that lists over 150 different chemicals and their recommended usage with ductile iron, iron, steel, 316 and 304 stainless steel, monel, brass, bronze, copper, aluminum and plastisol plastic.

The publication also shows which gasket materials are needed for the various chemicals when Kamlok Quick Couplers are used O-ring materials are needed when swivel joints are used with these chemicals and compounds.

Controlled Volume Metering Pump

541

Milton Roy Company, Philadelphia, Pa., is offering a 4-page bulletin that provides the details of its Mersemetric controlled volume metering pump which may be submerged in liquids to depths of fourteen feet or less as specified.

A capacity and pressure selection table is featured and other drawings and charts illustrate the unit's construction and operation. The bulletin also contains a discussion of the unit as it performs in a particular application.

Case Histories of Small Watershed Program

542

Caterpillar Tractor Company, Peoria, Ill., recently published an 8-page booklet that explains how some rural and urban communities are solving many of their flooding and sedimentation problems with the help of the Small Watershed Program.

Among the areas and communities whose problems are reported in the

CONTINUED ON PAGE 124A

PENNSALT CHLORINE

preferred for water and sewage treatment

Modern new sewage treatment plant at Boise, Idaho.

PENNSALT CHLORINE is uniform quality waterworks grade of chlorine used by hundreds of cities and communities throughout the country because of confidence in PENNSALT'S Quality Control of the product. Shipped in 100 and 150 lb. cylinders and ton containers by rail, truck and water.

Other PENNSALT Quality Chemicals

AMMONIA, Anhydrous. Waterworks grade, shipped in modern, lightweight cylinders which saves considerable freight cost and lightens the burden of handling. 50, 100, 150 lb. cylinders.

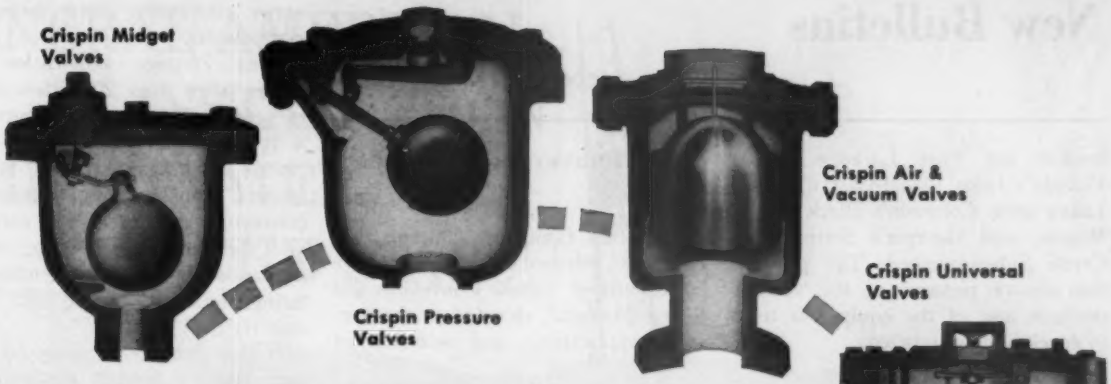
PERCHLORON. High-test calcium hypochlorite containing 70% available chlorine. Shipped in 100 lb. drums; cases—nine 5-lb. cans to a case.

FERRIC CHLORINE, Anhydrous. Use of PENNSALT'S Ferric Chloride in sewage disposal operations simplifies and improves performance. It provides immediate filtration without the usual losses in sedimentation time in the treatment of fresh and digested sludge. Increases filter efficiency and multiplies vacuum-filter capacities through superior coagulation. Available in non-returnable steel drums of 135 and 350 lbs. For information contact PENNSALT CHEMICALS CORPORATION, Tacoma 1, Wash.

INDUSTRIAL CHEMICALS DIVISION - WEST
TACOMA 1, WASHINGTON
Offices and Plants:
Los Angeles and Fresno, Calif., Philadelphia, Pa., Portland, Ore., Vancouver, B. C. (CRestwood 8-1412)

PENNSALT CHLORINE is made at Calvert City, Ky., Portland, Ore., Tacoma, Wash., Wyandotte, Mich., and Mexico City.

Pennsalt Chemicals
ESTABLISHED 1850

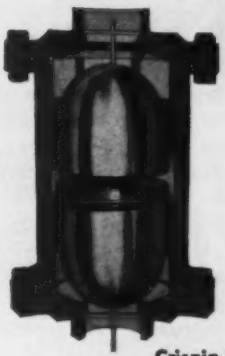


For positive air control...

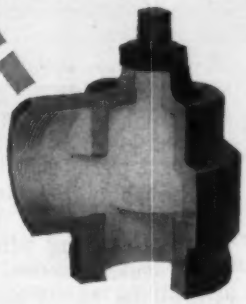
Crispin

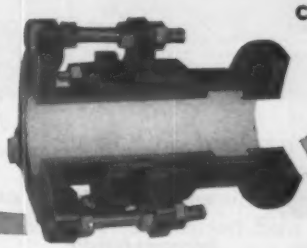
AUTOMATIC AIR VALVES

... preferred by works engineers for over 45 years



Crispin Air Valves safely control air in lines handling liquids to maintain efficient operations—prevent expensive failures. Simplified construction, easy accessibility, maximum durability, minimum maintenance and efficient operation are five solid reasons why Crispin Air Valves are completely dependable.





Write today **for this new Crispin Air Valve Catalog...**

AIR CONTROL VALVES FOR OVER 45 YEARS

multiplex

MANUFACTURING COMPANY
BERWICK, PENNSYLVANIA

MULTIPLEX MANUFACTURING COMPANY
DEPT. B, BERWICK, PENNSYLVANIA

Name_____

Company_____

Address_____

City_____ State_____

Title_____

New Bulletins

CONTINUED FROM PAGE 122A

booklet are Fort Laramie, Wyo., Florida's Lake Placid-East Chain of Lakes area, Colorado's Black Forest Region, and Georgia's Settingdown Creek Sub-watershed. The publication shows pictures of the various projects and of the equipment used to develop the watersheds.

Screw Conveyors and Feeders

543

Link-Belt Company, Chicago, Ill., has just released a comprehensive book, entitled "Screw Conveyors and Screw Feeders", devoted to the versatile applications and selection of screw conveyors, screw feeders and components.

This 76-page publication illustrates more than 20 different types of screws, 14 types of troughs, with 4 types of covers, 5 types of discharge openings and two types of feeders. The book shows how screw conveyors are used for conveying and elevating, distributing, reclaiming, collecting, mixing, blending, agitating, aerating, heating and cooling materials.

It also contains an extensive list of materials for which the conveyors may be used and include: light or heavy, fine or coarse, granular or flaky, hot or cold, wet or dry, sluggish or free-flowing materials from alfalfa meal to zinc oxide.

Proportioning Pump for Concentrated Corrosive Chemicals

544

Proportioneers Division, B-I-F Industries, Providence, R. I., is offering a new bulletin covering its Chem-O-Feeder positive displacement pump for feeding concentrated corrosive chemicals in the chemical and air conditioning fields and general industry.

This diaphragm-type pump, is made of corrosion-resistant materials and will efficiently feed such chemicals as 66 degree Baume Sulfuric Acid, Sodium Hydroxide, Caustic Soda, Phosphoric Acid, Plating and Photographic Solutions. The pump is easily installed, either floor, shelf or wall-mounted, and takes suction directly from the chemical shipping container.

The 2-page, bulletin contains a photograph of the pump, a list of chemicals fed by it, and a list of features including adjustable stroke length while in motion, 4 to 1 Range, capacity up to 0.7 GPH into discharge pressures up to 100 PSIG. Also included is a flow diagram of the pump installed in an air conditioning application.

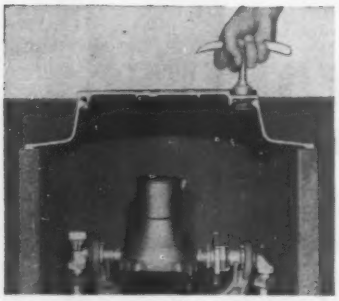
Maintenance-Safety Catalog Explains Plant-Wide Identification Program

545

W. H. Brady Co., Milwaukee, Wis., has announced availability of 32-page, illustrated catalog featuring

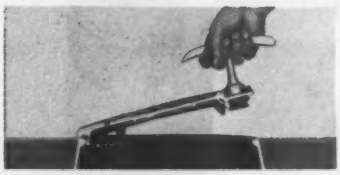
CONTINUED ON PAGE 126A

protection plus
WITH FORD METER BOX COVERS



The Ford Lifter Worm Lock protects both meter and pedestrian . . plus, acts as a "working" member of your meter reading and service departments.

Locking action pulls lid down tightly on cover.



Powerful screw-jack action lifts lid, breaks any ice or dirt crust.

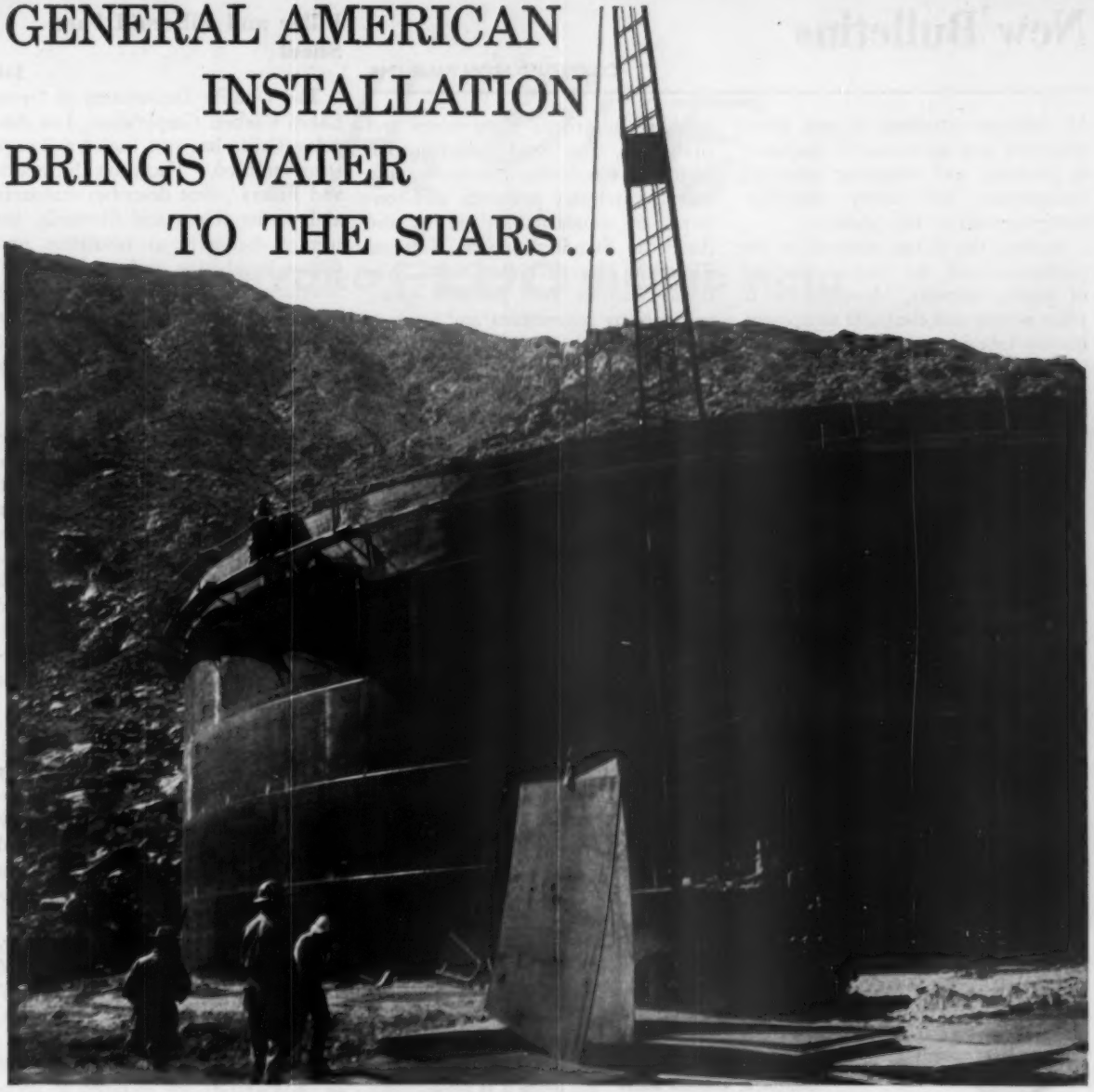
Unlocking action automatically engages Lifter Key and key becomes handle.

Can be operated with any pentagon key of the same size.

FOR BETTER WATER SERVICES FORD

THE FORD METER BOX COMPANY, INC. Wabash, Indiana

GENERAL AMERICAN INSTALLATION BRINGS WATER TO THE STARS...



Palm Springs is a thirsty city. In this desert playground of movie stars and sun-worshippers at the foot of water-rich Mt. San Jacinto are more gardens and swimming pools per capita than any other place in the world. Within the mountain are many underground streams. The problem was to tap the resources and store more water than existing reservoirs would hold. The answer—a 5,000,000 gallon tank fabricated in General American's shops, trucked to a hard-to-reach spot on the hillside and erected by a General American field crew.

General American won this contract because of ability to fabricate the tank and erect it despite difficulties of terrain. Shops at many locations and strategically-based field erection crews make it possible for General American to do the job efficiently in any part of the country.

We would like to discuss your water storage problems, so why not write or phone the nearest General American office. You'll find *it pays to plan with General American.*

Plate and Welding Division
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South LaSalle Street • Chicago 3, Illinois
Offices in principal cities

PLATE & WELDING DIVISION
GENERAL AMERICAN
TRADE MARK

New Bulletins

CONTINUED FROM PAGE 124A

15 different products to aid safety directors and maintenance engineers in planning, and executing industrial maintenance and safety identification programs in their plants.

Among the things covered in the publication are the proper marking of piping systems, identification of plant wiring and electrical equipment, correct lubrication of machinery, and marking hazardous plant areas and equipment. The Brady identification system is standardized to universally accepted industry practices, and conforms to standards set up by the American Standards Assn., National Electrical Manufacturers Assn., National Machine Tool Builders Assn., and various government and military specifications.

PACIFIC
A TYPE FOR EVERY SERVICE
RUGGED — DEPENDABLE
NON-CLOG
SEWAGE PUMPS
DRY PIT - WET PIT
SUBMERSIBLE
HORIZONTAL
CHOICE OF IMPELLERS
NON-CLOG DRY PIT pump with double suction elbow and stand. Send for Bulletin 1850.5.
NON-CLOG WET PIT with cover. Single unit. Duplex models with alternating controls available. Send for Bulletin 1850.2.
PACIFIC NON-CLOG PUMP with motor, motor support bracket, suction elbow and stand. Send for Bulletin 1850.5.
HORIZONTAL NON-CLOG MODEL with flexible coupling. Send for Bulletin 1850.5.
Outstanding performance and long trouble-free service from every type.
Pacific Non-Clog Sewage Pumps combine all desirable design features that assure efficient, economical and dependable operation and service.
Order now. ALL TYPES AVAILABLE FOR IMMEDIATE SHIPMENT.
SUBMERSIBLE NON-CLOG
A complete unit ready to install includes pump, motor, automatic controls and cable to control panel. Send for Bulletin 1850.5.
PACIFIC PUMPING CO.
Established 1907
Manufacturers and Distributors of Pumps for Every Service
MAIN OFFICE AND FACTORY: 9301 San Leandro St., Oakland 3, Calif.
OAKLAND, Calif. • Portland, Ore. • Seattle, Wash. • Los Angeles, Calif. • Dallas, Texas

Filler and Filteraid Fact Sheet

546

The Dicalite Department of Great Lakes Carbon Corporation, Los Angeles, Calif., has just issued a 2-page sheet entitled, "Facts on Filteraids and Fillers", that describes diatomite and perlite fillers and filteraids, the use of diatomite as insulation and diatomite-asbestos and carbon-based filteraids. A graphic table permits quick and ready comparison of the various types in terms of specific gravity, particle size, color, moisture absorption and other factors.

Shown in chart form are the flow-rate characteristics of eight standard grades of diatomite, one of perlite and one of carbon. In another chart, the sizes of particles removed from a liquid by five grades of diatomite filteraid are indicated. Characteristics are shown for diatomite in both its uncalcined form and its calcined and process-calcined forms. Special-process perlite characteristics are indicated, as well as characteristics for carbon-based fillers.

Magnetic Solenoid Valves

547

Magnatrol Valve Company, Hawthorne, N. J., has recently published a 20-page catalog describing and illustrating their complete line of electrically controlled magnetic solenoid valves.

The valve line includes normally closed and normally open solenoid valves used primarily for the control of water, oil, steam, air, solvents, gas and chemicals.

Cross-sectional diagrams as well as photographs are included to completely explain the valve function and operation. Each bulletin is accompanied with specifications in chart form where the individual may select the proper valve required and submit orders complete with price information.

Constant-Temperature-Humidity Instruments Listed

548

The American Instrument Co., Silver Spring, Md., has published its new catalog that includes among the instruments it describes, envorinmental test equipment that duplicates global climatic conditions, large and small test cabinets, baths, ovens,

CONTINUED ON PAGE 128A

H_2SiF_6

HYDRO FLUO SILICIC ACID

THE ROLE IT PLAYS IN

MUNICIPAL WATER FLUORIDATION

Controlled fluoridation of communal water supplies is rapidly becoming a standard process of water treatment. And, as the process gains in popularity across the nation, so is the use of hydrofluosilicic acid gaining increased recognition because of its superiority to solid fluoride salts on many counts. The chief advantages are lower cost, greater safety and a secure source of supply. They are important considerations for any city official charged with the dual responsibility of maintaining public health and, at the same time, administering municipal funds. They deserve a closer look.

Lower cost • The economy of hydrofluosilicic acid stems from several sources. Because it is a liquid and can be shipped in tankcars and tank trucks, transportation costs are lower. Tankcar freight rates are the lowest available.

Less storage space is required, as well as less handling. Hydrofluosilicic acid can be pumped directly from the shipping or storage container into filtered water conduits, resulting in substantial savings in direct labor. On the other hand, fluoride salts require extensive feeding equipment — dry feeders, dust control, dissolving tanks, hoppers, agitators — whereas a fluoride liquid can be handled easily by a proportionating pump or other standard solution-type feeder.

Greater safety • The liquid state of hydrofluosilicic acid completely eliminates the health hazard of fluoride dust — an ever-present threat to anyone handling fluoride salts. Costly safeguards are eliminated, too. No special handling equipment is needed. No separate storage rooms, exhaust fans, expensive ductwork or other special protective equipment. Hydrofluosilicic acid requires a minimum of handling, with maximum safety.

Unlimited supply • Hydrofluosilicic acid is a recovery product. It is derived from the process of converting phosphate rock to superphosphate. And, since *International* is the largest domestic producer of phosphate rock, you are assured of a dependable source of supply both today and in the years ahead.

For additional information on physical and chemical properties, methods of analysis and water fluoridation dosages, send your specific questions to *International* at the address below.

International Minerals & Chemical Corporation
Dept. WSW-16, Skokie, Illinois

Gentlemen:
Please send additional information on *International* Hydrofluosilicic Acid. I am particularly interested in:
☐ Water fluoridation ☐ Other uses

Name.....
Street.....
City.....Zone.....State.....

IMC
*Trademark Products for Growth *

INDUSTRIAL CHEMICALS DEPARTMENT
INTERNATIONAL MINERALS & CHEMICAL CORPORATION
Administrative Center: Skokie, Illinois
16-60

ACTIVATED SILICA SOL
. . . coagulant aid

The "method" of convenience . . .
- Liquid feed
- Quickly speeds floc formation
- No delays

Activated silica sol develops large, rapid settling floc. More impurities are removed. High quality, clear water is produced during exceptionally long filter runs.

N-Sol Processes, employing "N" sodium silicate, are PQ's patented methods for preparing activated silica sol. Licenses are available without royalty fee.

Write for this complete bulletin on the use of sodium silicate for "Raw and Waste Water Treatment".

PHILADELPHIA QUARTZ CO.
1166 Public Ledger Bldg., Philadelphia 6, Pa.

PQ SOLUBLE SILICATES

Trademarks Reg. U.S. Pat. Off.

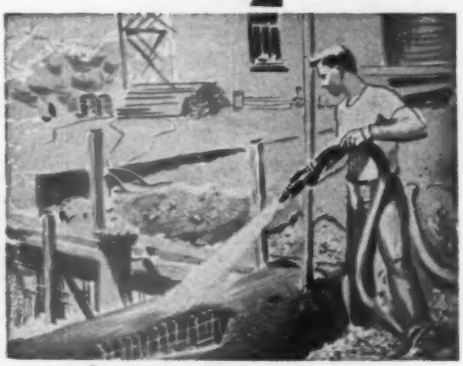
Associates: Philadelphia Quartz Co. of Calif. Berkeley & Los Angeles, Calif.; Tacoma, Wash.; National Silicates Limited, Toronto & Valleyfield, Canada

PQ Plants: Anderson, Ind.; Baltimore, Md.; Buffalo, N.Y.; Chester, Pa.; Jeffersonville, Ind.; Kansas City, Kan.; Rahway, N.J.; St. Louis, Mo.; Utica, Ill.

GUNITE does it 2 times as fast at 1/2 the cost

"Gunite" is the modern process (sand and cement applied pneumatically) for repairing, constructing, lining:

- Reservoirs
- Dams
- Filter Plants
- Sewage Disposal Plants
- Tanks
- Stadiums
- Bridges
- Sea Walls
- Swimming Pools, etc.



WRITE FOR MORE INFORMATION, INCLUDING 48 PAGE "GUNITE" BOOKLET.

PRESSURE Concrete Co.

FLORENCE, ALA. 1555 Helton Street

OTHER OFFICES IN

CHICAGO, ILL. 30 W. Washington Street

NEWARK 5, N. J. 193 Emmet Street

New Bulletins

CONTINUED FROM PAGE 126A

steam-humidity chambers, and bacteriological incubators. Hundreds of additional devices are presented, all designed for the precise control of temperature and humidity in the modern laboratory.

The catalog includes 41 pages of illustrations, descriptions, applications, and a temperature conversion chart from C to F, or F to C. A list of the sales engineering offices located throughout the United States is also included, and was prepared as a ready reference for persons seeking technical assistance in setting up complete systems for conducting tests under controlled humidity and temperature.

Multi-Shielded Drip-Proof Motors

549

Sterling Electric Motors, Inc., announces availability of a bulletin, describing the newly developed "Sterlicone Multi-Shielded", drip-proof motors introduced recently by the company.

The bulletin illustrates the five outstanding design features, and explains in detail how these motors can replace totally-enclosed motors in many applications where adverse conditions of moisture, humidity, dust, oil and chemicals prevail.

Corrugated Metal Pipe

550

Armco Drainage & Metal Products, Inc., Middletown, Ohio, has published a new and up-to-date, 16-page catalog on its corrugated metal pipe and pipe-arch. The booklet contains useful tables, brief data on the various types of structures, and information about joints and fittings and proper installation methods. Typical installations are pictured, and diagrams furnish additional installation information.

Motor Operation Data Sheet

551

Jamesbury Corporation, Worcester, Mass., announces the addition of electric motor operators to its

CONTINUED ON PAGE 130A

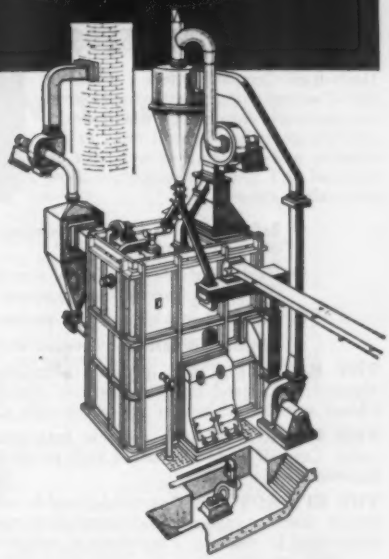
Dispose of Sewage Sludge the Modern Way

The widespread acceptance of the C-E Raymond System is based on its solid advantages. This compact system combines the principles of Flash Drying and Incineration in a unit in which filter cake can be reduced to a sterile ash . . . or flash-dried to a salable fertilizer and soil conditioner. Revenue from the latter is often sufficient to pay a substantial part of plant operating costs.

Either operation can be performed alone, or combined in any desired proportion. Effective high-temperature deodorization to remove foul odors from combustion gases is available for both processes.

A C-E Raymond System can mean an end to your community's sludge disposal problems . . . as it has in municipalities across the nation. Contact the Combustion office nearest you for specific recommendations. A C-E specialist will be glad to discuss your requirements and help plan an installation with you or your consultants.

B-9988



COMBUSTION ENGINEERING

RAYMOND DIVISION, 1132 West Blackhawk Street, Chicago 22, Illinois

Eastern Office: 200 Madison Avenue, New York 16, N. Y. • Western Office: 510 West Sixth Street, Los Angeles 14, Cal.

Canada: Combustion Engineering-Superheater Ltd.

ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WASTE DISPOSAL

2,000,000 gallons—Cedar Hills Reservoir, Ridgewood, New Jersey

- *minimum maintenance*
- *75% construction cost spent locally*
- *architecturally modern*
- *longest service life*
- *lowest overall cost*

In the development of residential and industrial water supply facilities today, no other type of tank offers so many advantages as does the Prestressed Concrete Tank. Modern in engineering and design, proven in service, lowest in cost... prestressed concrete should be considered in any tank planning.

Send for Bulletin T-22.

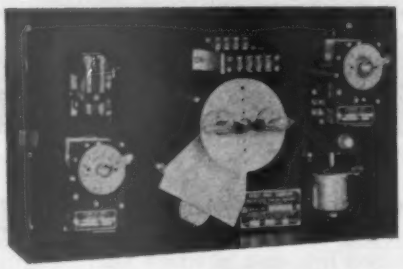
THE PRELOAD COMPANY, INC.

PRELOAD

355 Lexington Ave., New York 17, N. Y. • Tel.: MU 7-0488
351 Jefferson, Dallas, Texas • Tel.: WHitehall 1-5707

PRELOAD CONCRETE STRUCTURES INC.	THE CANADA GUNITE COMPANY, LTD.	HERRICK IRON WORKS
837 Old Country Road	125 Hymus Blvd.	28400 Clawiter Road
Westbury, Long Island, N. Y.	Pointe Claire, P.Q., Canada	Hayward, Calif.
Tel.: EDgewood 3-4040	Tel.: Oxford 5-6772	Tel.: Lucerne 1-4451

PRESSURE CONTROLS FOR ALL YOUR NEEDS



Healy-Ruff Company offers a complete line of easy-to-install, simple-to-use pressure-sensing controls for water works and sewage fields. Control only, or indicating and recording as well, can be supplied. All systems incorporate these desirable features:

- Ball bearing rotation and springless mechanism—measures pressure to ½% of operating range.
- Field adjustable time delays, provided where necessary to prevent start and stop surges from cycling the pumps
- Independent high and low pressure adjustments
- Minimum differential between start and stop points

THE R-4 ROTOTROL permits controlling high and low elevation of water in an elevated tank, stand pipe, or reservoir. Automatically compensates for pumping friction. Closed system and booster system controls also available. *Bulletin R-4*

THE PW ROTOTROL controls both pressure and water level in hydropneumatic tanks. Cuts off pumps on either high pressure or high level. Air-add or air-release types. *Bulletin PW-6*

THE RPS ROTOTROL controls level in pumping stations, sewage plants or reservoirs. Senses level change through corresponding change of pressure in compression bell submerged in wet well. Purged air or compression pipe types. *Bulletins RPS and RS3*

HEALY-RUFF COMPANY
783 Hampden Avenue • St. Paul 14, Minn.

First in dependable controls for waterworks and sewage—since 1929

Remote supervisory controls • Complete system controls • Elevated tank controls • Sump controls • Hydropneumatic tank controls • Float controls • Alternators • Alarm silencers • Protective devices

New Bulletins

CONTINUED FROM PAGE 128A

product line, and the availability of a new product data sheet, which provides technical information on the new units. Jamesbury is introducing two models designed for use with all Jamesbury, Double Seal, ball valves in the ¼" through 4" sizes.

The data sheet has dimensional tables on the valves for which the operators were designed, and a wiring diagram shows the hook-up of the two units.

How To Plan Valve Installations

552

Homestead Valve Manufacturing Co., Coraopolis, Pa., is offering a reference book covering its lubricated plug valves that is designed to answer most questions regarding valve installation for a pit, under ground, above the ground, or at a distance from the central control location.

The publication is intended to advise how the user may obtain both ease and convenience of operation, touching such subjects as air, hydraulic, or electric controls; chain wheels; extension stems; spur gears, and worm and gear. The book also discusses how these controls may be applied to three-way and four-way valves, and to straightways.

General Purpose Control Catalog

553

General Electric Company, Schenectady, N. Y., has published its new 72-page catalog that provides information covering the complete line of control devices manufactured by the company's General Purpose Control Department.

The publication features horsepower selection charts that list motors from one-fourth through 200 horsepower, providing a quick selection of starters, heaters and push button stations necessary for the control of these motors.

Charts, diagrams, photographs, schematics and cutaways are con-

CONTINUED ON PAGE 132A

WHEN MINUTES COUNT

YOU'LL BE GLAD YOU HAVE
WILLAMETTE LIST 26 BALL VALVES ON THE LINE

Specifically designed for fast, tight closure under adverse conditions at all pressures, List 26 Ball valves are your best protection . . . when minutes count.

Willamette List 26 Ball Valves are specified for a wide range of services:

Pump Discharge — Automatic stop and check.

Pressure Relief—Electric or pressure controlled.

Pressure Regulating and Emergency Line Check—Especially for distribution grid systems.

Altitude — Automatic, for elevated tanks or basins.

Stop — Strategically located where dependability is critical.

CHARACTERISTICS

1. Full port opening with proven metal to metal seats, drip tight at all pressures.
2. Flow characteristics minimize cavitation, reduce vibration in free discharge or throttling service.
3. Most dependable valve for any emergency stop service requiring quick, controlled closure under adverse conditions—due to inherent water-wheel principle and proper multiplication of leverage.
4. Minimized surge and pressure rise due to ideal closing characteristics —87% of port area is cut off in first 50% of operator closing stroke. Remaining 13% is cut off in last 50% of operator closing stroke.
5. Field maintenance problems are reduced to a minimum: both body and plug seats replaceable in the field; valves can be repacked under full operating pressure.
6. Installations all over the country have thoroughly tested and proved List 26 Valves in all types of service under most adverse operating conditions.

For full particulars and specifications address inquiries to:

Willamette Iron and Steel Company, Valve Department, 2800 N.W. Front Avenue, Portland 10, Oregon.

OTHER WILLAMETTE VALVES—Willamette Cone Valves: 150 PSI to 250 PSI, sizes 10-48".
Butterfly Valves, metal and rubber seated. Special valves and control systems.

WILLAMETTE IRON AND STEEL COMPANY
2800 N.W. FRONT AVENUE • PORTLAND 10, OREGON
VALVE DEPARTMENT

Willamette VALVES

KILLS
PSYCHODA FLIES
in trickling filters

FORMULA R.S.C.
breaks the barrier of resistance for effective, sustained control of Psychoda flies in human and industrial wastes treatment plants.

kills flies, larvae and pupae

without damage to zoogleal film

without destroying beneficial bacteria

without reducing filter efficiency

NEW INHIBITORY FACTOR—Hundreds of tests have demonstrated that R.S.C. is extremely effective in killing Psychodae which have shown high degree of resistance to DDT, Methoxychlor, Lindane, Chlordane, Dieldrin, Aldrin, Malathion and other insecticides.

This is accomplished by an inhibitory factor which renders a hitherto resistant fly susceptible to the insecticides in the R.S.C. formula. Field tests in such widely separated areas as Illinois, Texas, Florida have shown that use of R.S.C. reduces filter fly population to practically nil.

EASY TO USE—Dose with R.S.C. liquid concentrate through primary effluent and spray surrounding surfaces to kill flying adults.

SAFE, ECONOMICAL—R.S.C. is registered by the United States Department of Agriculture for control of Psychoda flies. When used according to directions, R.S.C. is safe, economical, and the most effective method of filter fly control to date.

Send for literature and field test reports.

For a cleaner plant this summer, use

T.M.
R S C
PAT. APPL. FOR
GLENN
CHEMICAL CO.
Industrial Chemicals Division
CHICAGO 14, ILLINOIS

New Bulletins

CONTINUED FROM PAGE 130A

tained throughout the catalog, and complete product description is given of motor starters, both manual and magnetic; contractors; relays; solenoids; limit switches; push buttons; static control and pilot devices.

In addition, dimensional data and application information for each device is listed, and supplemental bulletins which describe the specific product type in greater detail are also advised.

Self Curing Zinc Coating

554

Amercoat Corporation, South Gate, California, is offering a 2-page bulletin that describes its Zinkote product; a 100 per cent inorganic coating that protects bare steel from water, severe weathering, salt spray and abrasion.

The bulletin describes the product's composition and application and includes a guide for ordering it. Zinkote is unaffected by solvents and is not flammable, volatile or toxic. Moreover, it may be applied with regular painting equipment.

Sealless Pumps Solve Chlorine Problem

555

Chempump Division, Fostoria Corporation, Huntingdon Valley, Pa., is offering a 2-page release which describes the case history of how their leak-proof, sealless pumps solved the problem of transferring —10° F. liquid chlorine from 50-ton capacity storage tanks into cylinders and tank cars.

The literature contains both diagrams and photographs which illustrate features of the text.

Sewage Testing Unit

556

Fisher Scientific Company, Pittsburgh, Pa., has published a 16-page booklet describing their recently developed "packaged labs". These are exclusively designed units that contain "everything necessary for modern waste-water analysis, from BOD incubators to red pencils".

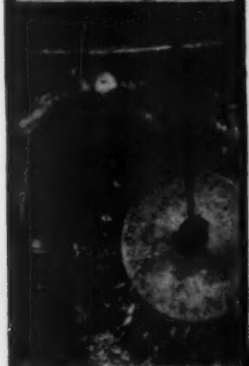
CONTINUED ON PAGE 134A

Lottie Binz...
your hostess in
LOTTIE BINZ, GEN. MGR.
Miami Beach
AIR CONDITIONED
HEATED
SWIMMING POOL
OCEAN BEACH
FREE PARKING - PARK OWN CAR IF SO DESIRED
COFFEE SHOP
COCKTAIL LOUNGE
SOLARIUM
PLANNED ENTERTAINMENT
CARD ROOM - TELEVISION
•
EUROPEAN PLAN
April 20 to Dec. 15 $6, $7, $8, $9, $10
July and August—add $1 per day
1 or 2 persons
WITH MEALS add $3.00 per day per person—includes complete breakfast and DeLuxe Dinner.
•
KITCHENETTE APARTMENTS
April 20 to Dec. 15 $8, $10, $12 per day
1 or 2 persons
•
Write Today for our free color folder

THE
BlueWaters
100% AIR CONDITIONED

Miami Beach
74th STREET
on the OCEAN
Florida

GO THE ROBINSON ROUTE TO ELIMINATE YOUR PIPE CLEANING PROBLEMS



The shortest distance between two points is supposedly a straight line, but pipe cleaning presents many "curves"! That's why your community needs the professional experience and custom designed tools of Robinson Pipe Cleaning Company to get the job done right. Robinson gets 'em clean with the latest methods and equipment, expertly trained crews and careful supervision. Hundreds of communities throughout the country will attest to Robinson's "Quality" workmanship performed in record time and at lowest costs.

GO THE RIGHT DIRECTION

CALL COLLECT PITTSBURGH, PA. TE. 5-5170

OR CANONSBURG, PA. SH. 5-5200

GET THE FULL FACTS, FREE SURVEYS AND ESTIMATES .... NO OBLIGATIONS!

GO THE
Robinson Route
PIPE CLEANING CO.
209 WEST PIKE STREET, CANONSBURG, PA.

24-HOUR SERVICE—TELEPHONE ALWAYS ANSWERED

PITTSBURGH, TE. 5-5170 or CANONSBURG, SH. 5-5200

Temperature range from 5° to 50°C with overall temperature uniformity meeting rigid APHA specs . . . more than a BOD cabinet . . . versatile enough for drug storage, serum studies, dairy product testing, many more tasks . . . external controls . . . forced air circulation . . . unobstructed interior . . . increased working space at NO increase in price . . . write today for Bulletin 303 and the name of your nearest stocking distributor.

SINCE 1920

PRECISION SCIENTIFIC CO. PSI

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Local Offices in Chicago • Cleveland • Houston
New York • Philadelphia • San Francisco

ENSLOW

STABILITY INDICATOR

For checking the equilibrium of a finished water, and supplying an index useful in controlling anti-corrosion treatment. Catalog No. 83-895

WRITE:

Phipps & Bird, Inc.

P. O. Box 2V Richmond 5, Va.

New Bulletins

CONTINUED FROM PAGE 132A

Features of the booklets include photographs of the complete units and their components, diagrams showing how the various equipment items are arranged in the drawers of the cabinets, and a detailed listing of the items furnished with the particular models.

The "packaged labs" are available for small plants (population under 7500); large primary treatment plants (population over 7500); medium-size secondary treatment plants (7500 to 25,000 population); and large secondary treatment plants (over 25,000 population).

Multi-Pointer Gauge Unit

557

Bailey Meter Company, Cleveland, Ohio, have announced the availability of a new, 4-page product specification bulletin that describes its Multi-Pointer Gage Unit used for pressure and level measurements, and for the pneumatic transmitting or receiving of these measurements.

A feature of the bulletin is an actual size drawing of the 7" indicating scale which is presented to illustrate its readability. Other features include illustrations of the unit's components parts and various tables explaining the unit's construction, operation and application.

Rotary Vacuum Filters

558

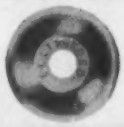
Filtration Engineers Division, American Machine and Metals, Inc., East Moline, Ill., has made available its 24-page bulletin that describes and illustrates its line of rotary vacuum filters.

Featured in the bulletin is a 2-page spread cut-away of a filter that, with brief, process explanations, shows in detail how the equipment operates. Each of the main parts of the filter are further explained in separate sections.

The bulletin contains a number of photographs, diagrams, charts and other drawings that provide a detailed presentation of the equipment and its use. An entire page is used to present three basic installation layouts in diagram form.

CONTINUED ON PAGE 136A

Ellis Heavy Duty Pipe Cutters For Pipe Up To 16" Dia.



With Long Lasting Cutter Wheels

Designed for water works men who appreciate the rugged construction of drop-forged frame and links; and a tool that assures no pipe breakage, no re-cutting and no spoilage.

THREE SIZES

No. 01 for 4" to 8" Pipe
No. 1 for 4" to 12" Pipe
No. 1B for 4" to 16" Pipe

write today for free literature

ELLIS & FORD MFG. CO.
1100 COOLIDGE RD.
BIRMINGHAM, MICH.

90% cut in operating and maintenance cost means

CASH in the BANK for you!

New, transistorized

M-SCOPE PIPE FINDER

only $189.50

Rugged, transistorized construction practically eliminates maintenance costs . . . extends battery life to a year or more. Pinpoint accuracy, greatest depth penetration make the M-Scope first choice in the field!

New, Heavy Duty
LEAK DETECTOR $295.00
Send for FREE 1960 Catalog

FISHER
Research Laboratory, Inc.
Dept. WS-2, Palo Alto, California.

NEW SUTORBILT "88" ROTARY POSITIVE BLOWERS ARE LIGHTER . . . SMALLER . . . QUIETER

and so versatile in performance that just six models cover the range from 200 to 2200 cfm up to 15 psi

Brand New from Sutorbilt, Series "88" Rotary Positive Blowers pack oversize output in the most versatile line of light-weight, space-saving blowers available for high performance operation. Retaining such efficiencies as the 2-lobed counter-rotating impeller and the special Sutorbilt timing hub, these simple, rugged units feature:

High Strength, Heavy Duty Construction . . . increase service life, shrink blower size, insure low maintenance, peak performance.

Choice of Driving Methods . . . Locked bearings on both impeller shafts permit direct motor or V-belt drive. Availability of these new blowers as standard or gear head units furthers design possibilities, offers a wide range of ratios up to approximately 3 to 1.

More Mounting Possibilities . . . Series "88" blowers can be mounted horizontally or vertically on pedestal type pipe plates or directly to flange type electric motors with a special drive end cover plate. Also available is a mounting kit for power take-off operation on frame rail of trucks and tractors. And this entire line of compact blowers can also be supplied with flange adapters and couplings for mounting on air-cooled gas engines, widely used on bulk cement and other trailers.

Self-contained Lubrication . . . A self-contained splash system oil lubricates the anti-friction bearings and precision helical steel gears, eliminates any need for external oil feed systems and coolers.

Low Sound Level . . . Light-weight, compact Sutorbilt package-type silencers that lower the sound level with little pressure drop can easily be fitted to all Series "88" blowers. Find out more about these radically new blowers that offer you a wide range of out-puts coupled with light-weight, small size and minimum power requirements. Write for literature today.

Representatives located in principal cities. Consult your classified telephone directory.

SUTORBILT IS WELL BUILT

CORPORATION, 2914 EAST VICTORIA ST. • COMPTON, CALIF.
SUBSIDIARY OF FULLER COMPANY • CATASAUQUA, PA.

TRADE MARK

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PRATT®
Monoflange
Mark -II
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CONTINUED FROM PAGE 134A

Mass., is offering literature that describes their recommendations for making a more secure and efficient sewer pipe joint with cement; a joint that is tight and which minimizes root intrusion and still provides a good alignment of the joint.

The procedure also allows the worker to construct joints in water-bearing trenches.

Coagulant Aids

562

Hagan Chemicals & Controls, Inc., Pittsburgh, Pa., is offering its recently published bulletin describing their Coagulant Aids which are used to speed up and improve coagulation and sedimentation in municipal and industrial water clarification systems.

In addition to municipal and industrial water system applications, the illustrated bulletin covers the use of these aids in waste water systems, brine clarification, color removal, and high solids-liquid separations. As pointed out in the literature, the aids are effective over a wide pH range and can be dry fed or introduced as a slurry solution.

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Rotary Drying Equipment

559

General American Transportation Corp., Chicago, Ill., is offering a 14-page bulletin which describes in detail the design, construction, application and general operation of its rotary drying equipment.

Photographs, of which the bulletin is generously provided, show how the equipment is tested, manufactured, and installed on various job applications. The different types of dryers are explained in separate sections, and a design data sheet is included with the brochure.

Sludge Heater Bulletin

560

Ralph B. Carter Co., Hackensack, N. J., has recently released a bulletin describing its forced-counterflow, tube-within-tube, sludge heater and heat exchanger units.

Included in this bulletin are descriptions of operation, design and construction features, performance and dimension data.

Sewer Pipe Joints

561

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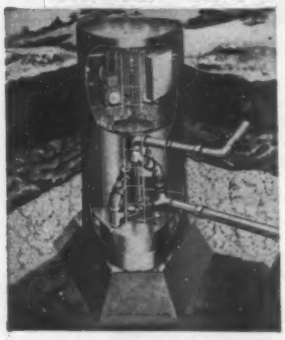

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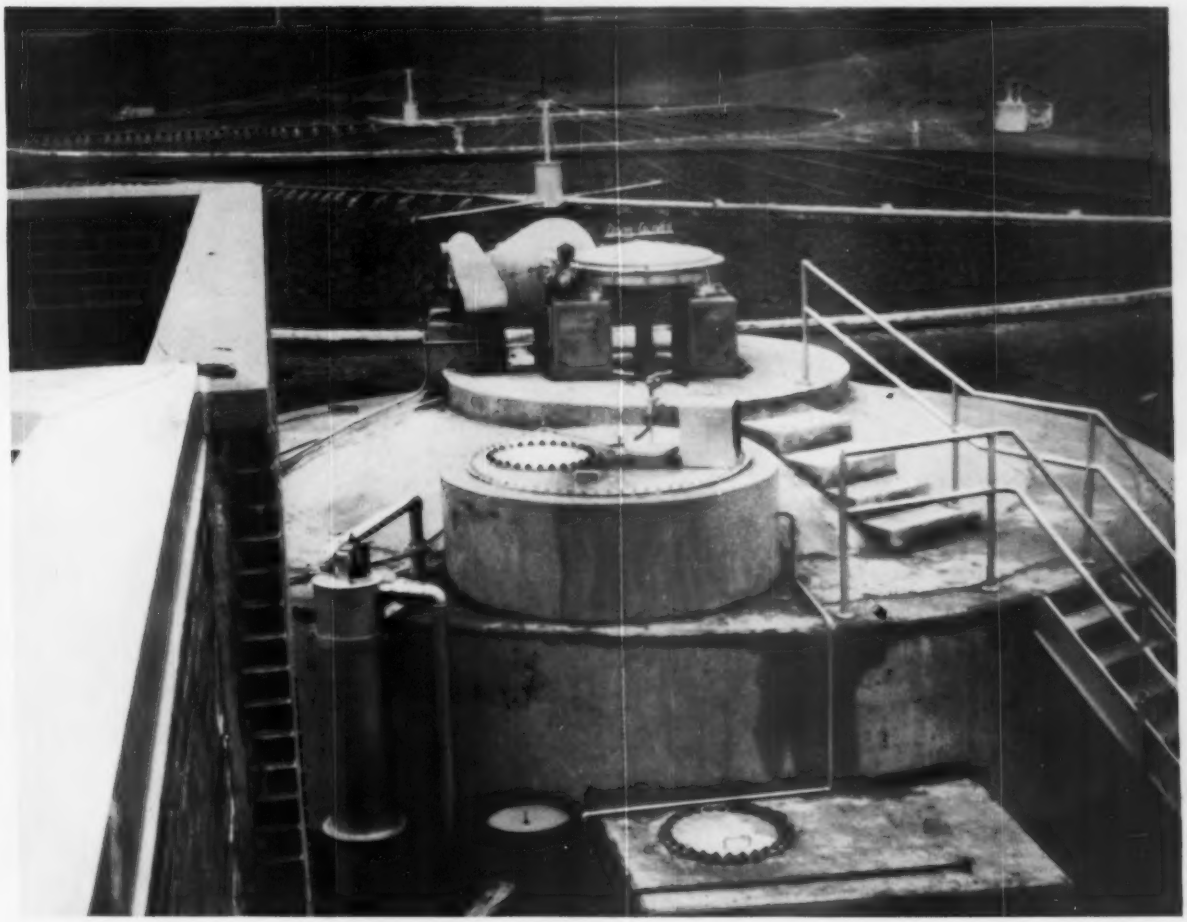

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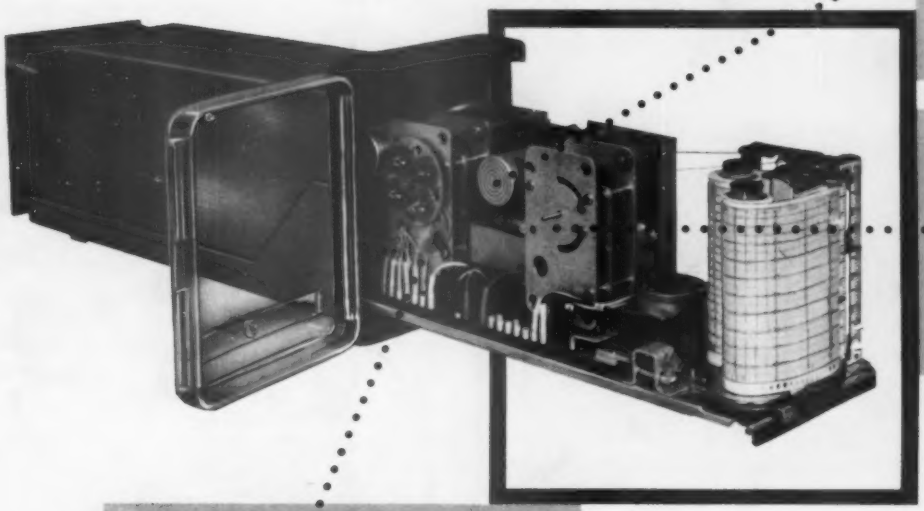

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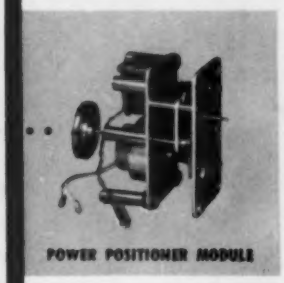

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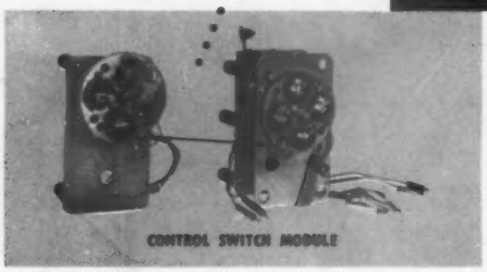

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- **High, enduring accuracy** . . . better than 0.5% of full scale over 5:1 flow range (10:1 optional at extra cost).
- **High speed operation, high repeatability** . . . due to new compact, balanced-movement design of power-positioner mechanism.
- **Application versatility** . . . up to 8 alarm or control switches for compact 4" recorder . . . up to 16 for 12" circular chart receiver. Potentiometer for electrical summation and data logging-computing. (Switches and potentiometers optional.)
- **Faster, quieter response, low power consumption** . . . DC power supply . . . nominally rated at 35V . . . 12 to 20 watts depending upon arrangement.

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